USDA

United States
Department of
Agriculture

Forest
Service

December 2016

Environmental Assessment

FIGHTINGTOWN CREEK EARLY-SUCCESSIONAL HABITAT PROJECT

Conasauga Ranger District, Chattahoochee-Oconee National Forests
Fannin and Gilmer Counties, Georgia

For information contact:

Ruth Stokes

Conasauga Ranger District
706-695-6736
rbstokes@fs.fed.us

Table of Contents

Contents

Summary iiii

Introduction 1
- Project Area Description 1
- Background 1
- Purpose and Need for Action 1
- Proposed Action 3
- Decision Framework 4
- Public Involvement 4
- Issues 5

Alternatives, including the Proposed Action 6
- Alternative 1 6
- Alternative 2 6
- Alternative 3 9
- Design Criteria 13
- Comparison of Alternatives 15

Environmental Consequences 16
- Vegetation Resources 17
- Soil, Water, and Climate 35
- Wildlife Habitat 48
- Social Resources 56
- Economic Analysis 63

Consultation and Coordination 65

APPENDIX A. Maps (Figures 1, 2, 3)
APPENDIX B. Scenery Treatment Guide - Southern Regional National Forests

SUMMARY

The Forest Service proposes to improve wildlife habitat diversity in the Fightingtown Creek watershed. This area is within the Conasauga Ranger District, Chattahoochee-Oconee National Forests, Georgia. This action is needed because there is a lack of successional stage diversity in the area.

The proposed action may include even-aged regeneration harvest to create young forest habitat. The proposed action also includes the designation of small blocks of old growth habitat.

In addition to the proposed action (Alternative 2), the Forest Service also evaluated the following alternatives:

- Alternative 1 - No action
- Alternative 3 - Partial canopy retention

Based upon the effects of the alternatives, the responsible official will decide which alternative or combination of alternatives best meets the purpose and need for action in the Fightingtown Creek watershed.

INTRODUCTION

Project Area Description

The Fightingtown Creek project area is located in Fannin and Gilmer Counties, Georgia and lies within the 26,171 acre Fightingtown Creek drainage, which is comprised of two sub-watersheds (Fightingtown Creek and Little Fightingtown Creek). The project area encompasses approximately 11,675 acres of National Forest System lands located in Compartments 675-685 (see Figure 1). The majority of the area is comprised of mature forest on rolling to steep, north- and east-facing slopes between 2000 and 3500 feet elevation. White pine and mixed mesophytic hardwoods dominate the area.

Background

The Chattahoochee-Oconee National Forests are divided into areas (or zones) called Management Prescriptions (MRx). The goals and emphasis of management for lands allocated to each prescription are different, providing for a variety of outputs, services, and values to be managed across the National Forest. Lands within the Fightingtown Creek project area are allocated to five MRx (Table 1). Approximately 73% of Forest Service land in the area is within MRx 9.H, which emphasizes the management, maintenance, and/or restoration of plant associations to their ecological potential. The focus should be on 1) communities in decline, 2) communities converted from historic composition by land uses, 3) communities on ecologically appropriate sites but unable to maintain themselves, and 4) communities infrequent on national forest but not regionally rare (Forest Plan, p. 3-167) (USDA Forest Service 2004b). The Forest Service utilizes active management to restore or maintain forest communities in these categories in order to support viable populations of plants and animals associated with these communities.

Table 1. Management Prescriptions in the Fightingtown Creek project area.

MRx	Name and Description	Acres	Percent of Analysis Area
4.D	Botanical-zoological areas	153	1%
7.B	Scenic corridors and sensitive view-sheds	634	6%
8.E.3	High-elevation, early-successional habitat	93	1%
9.H	Management, maintenance, and restoration of plant associations to their ecological potential	8,531	73%
12.A	Remote backcountry recreation – few open roads	2,264	19%
Total		**11,675**	**100%**

Purpose and Need for Action

The purpose of this initiative is to increase successional stage and wildlife habitat diversity. This action is needed because existing conditions in the Fightingtown Creek analysis area indicate a need and opportunity to maintain a range of successional forest habitats, including early-successional habitat and old growth. Former land uses in the Fightingtown Creek project area produced a diverse mixture of successional stages resulting in abundant native

wildlife, including a notable local population of ruffed grouse *(Bonasa umbellus)*. The maturing of the forest and a lack of forest management activities in the project area for several decades have resulted in the loss of early-successional stage forest habitats (ESH). ESH includes patches of young forest which provide important habitat attributes, including a diverse food source, nesting, and escape cover. These benefits are ephemeral and disappear as young forests begin to mature and canopies close over time. A wide variety of native wildlife species utilize such habitats during different successional phases, with ruffed grouse utilizing the ESH patches for up to two decades. Currently, over 90 percent of the project area is comprised of mid- to late- successional forest, with nearly three-quarters of this being older than 80 years old. This large, contiguous block of mature forest provides important wildlife habitat due to its leafy tree canopy, hard mast production, den trees, snags, and cool, shady microclimates; however, species requiring ESH face continued decline without interspersed patches of young forest. ESH is created through natural disturbances, such as fire or weather-related events, or through controlled forest management that mimics natural processes in the absence of such disturbances. Non-forested areas on adjacent private lands are primarily managed as pastures, yards, and gardens, which provide poor ESH, even for grassland bird species; and offer very little value to disturbance-dependent forest dwellers such as ruffed grouse and breeding migratory songbirds.

This lack of a diversity of successional stages of forest habitats is common across the national forest and not limited to the Fightingtown Creek project area. Breeding bird survey data from across the eastern United States show that ESH-dependent birds continue on steady and significant downward trends due to the limited availability of this important habitat condition (Hunter et al. 2001). The importance of maintaining a range of successional stage habitats is reflected in numerous publications and in management plans throughout the United States, including all the Southern Appalachian National Forests' Land and Resource Management Plans (Forest Plans).

This initiative responds to the goals and objectives outlined in the Chattahoochee-Oconee's Forest Plan, and helps move the project area towards desired conditions described in that plan, including:

> **Forest-wide Goal 2** - *A diversity of habitat will be provided for the full range of native and other desired species. Sufficient amounts of interior or late-successional habitat as well as early-successional habitat will be provided to meet needs of all successional communities. Early-successional habitat will be well distributed in all forest types, elevations, aspects, and slopes including riparian corridors (Forest Plan p. 2-4).*

Forest Plan direction for MRx 9.H (which comprises 73% of the project area) includes the following objective pertaining to successional stage management:

> **MRx Objective 9.H.01** - *Manage forest successional stages to maintain a minimum of 50 percent of forested acres in mid- to late-successional forest, including old growth; a minimum of 20 percent of forested acres in late-successional forest, including old growth; and 4 to 10 percent per decade in early-successional forest.*

The distribution of successional stages in the Fightingtown Creek project area is not consistent with objectives in the Forest Plan, especially within MRx 9.H. There is no ESH in the project area, and there is a surplus of mid-late and late successional stage forest. **There is an opportunity to create from 350 to 970 acres of ESH in the Fightingtown Creek project area.**

Existing conditions also indicate a need and opportunity to designate a percentage of the project area as blocks of old growth habitat in order to meet Forest Plan goals and objectives, such as:

> **Forest-wide Goal 20** – *Provide a well-distributed and representative network of large, medium and small potential old growth blocks in the Blue Ridge Mountains and Southern Ridge and Valley ecological sections.*
>
> **Objective 20.1 -** *Reserve 5 percent of each 6th level HUC (sub-watershed) that has at least 1000 acres of National Forest in management that will conserve existing, or provide for the development of future old growth.*

Currently, neither of the two Fightingtown Creek sub-watersheds (Fightingtown Creek-McClure Creek, HUC# 060200030204 and Little Fightingtown Creek, HUC# 060200030205) contain designated sufficient amounts of old growth or old growth-compatible MRx that meet this objective. Fightingtown Creek-McClure Creek contains 0 acres (0%) of designated old growth or old growth-compatible MRx, and Little Fightingtown contains 153 acres of MRx 4.D (botanical-zoological area) which is an old growth-compatible MRx. This represents 3.6% of the Little Fightingtown Creek watershed. **There is an opportunity to designate approximately 400 acres within the two watersheds as small blocks of old growth forest.**

Proposed Action

Timber Harvest -The Forest Service proposes to harvest approximately 436 acres in the Fightingtown Creek drainage by a combination of commercial and noncommercial timber harvest. The majority of overstory trees in these stands would be removed, and the stands would be allowed to naturally regenerate. These stands are dominated by mesic deciduous hardwoods or white pine (*Pinus strobus*) and would likely regenerate to the same species. A portion of the trees (minimum of 15 ft^2 per acre) would be reserved from cutting. These trees would be retained in a non-uniform and variable distribution and would remain on site indefinitely. Long-lived species such as white oak (*Quercus alba*) would be selected as reserve trees to be retained.

Old Growth Designation – To meet old-growth allocation objectives in the project area, over 400 acres would be designated for old-growth conservation through small block allocations (i.e. less than 100 acres in size). Stands that best meet four defining criteria described in the Region 8 Old Growth Guidance (USDA Forest Service 1997) would be selected for designation as old-growth: 1) those that most nearly meet minimum age requirements, 2) no obvious human disturbance, 3) minimum basal areas of stems greater than 5 inches diameter at breast height (dbh) and larger, and 4) the dbh of the largest trees.

Associated Road Activities –
Road Management Activities: Selected Forest Service System roads in the project area were recommended for changes in management and maintenance levels in the draft Transportation Analysis Process/Report completed by the Forest in 2012. These recommendations and other actions could include seasonal closure of roads, reduction in objective maintenance level, placement of gates, and seeding of roads with preferred vegetation for wildlife use.
Road Reconstruction: This activity includes minor reconstruction needed to widen segments of existing Forest Service System roads to improve access to the proposed vegetation management activities. Road reconstruction activities could include: widening of roadbed surface in curves, removal of vegetation in roadbed surface, improvement of drainage structures (culverts, lead-off ditches and rolling dips), spot surface placement of gravel, and erosion control.
Road Maintenance: Road maintenance activities would be conducted on segments of existing Forest Service System roads utilized for the vegetation management activities included in this proposal. Activities could include surface blading, brushing of roadside vegetation, spot placement of gravel, maintenance or improvement of drainage structures, and erosion control.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action and the other alternatives in order to make the following decisions:

- Does the Environmental Assessment have sufficient site-specific environmental analysis?
- Will the proposed actions proceed as proposed, as modified by an alternative, or not at all?
- Does the proposed action or selected alternative meet the purpose and need for action?
- Is the selected alternative consistent with the Forest Plan, or shall the Forest Plan be amended in this action?
- Does the proposed action or selected alternative as analyzed, comply with applicable standards and guidelines found in the Forest Plan and all laws governing Forest Service actions?

Public Involvement

The proposal was listed in the Schedule of Proposed Actions on July 1, 2015. The proposal was provided to the public and other agencies for comment during scoping on August 17, 2015. Approximately 265 letters or emails were received during the scoping period. An interdisciplinary team comprised of Forest Service specialists was formed in order to begin to analyze the comments and begin the environmental analysis. Using the comments from the public, other agencies, and interested user groups, the IDT developed a list of issues to address.

Issues

The Forest Service identified six issues raised during scoping. These issues include:

1. The proposed action may affect forest soils and water quality.
2. The proposed action may affect wildlife species dependent upon mature forest habitat, including those dependent upon hard mast (acorns and nuts).
3. The proposed action may affect the species composition of the forest in the project area.
4. The need for ESH may be satisfied by different harvest methods and/or by the treatment of younger stands.
5. The proposed action may affect recreational users of the project area.
6. The proposed action should include implementing the recommendations in the TAR/TAP, such as reducing maintenance levels of roads or permanent or seasonal closure of roads.

These issues will be addressed in the Environmental Consequences section of this document (beginning on page 16) and/or are addressed in the Design Criteria section (pages 13-15).

In addition, an alternative to the proposed action (called Alternative 3) was developed in response to several of these issues. A draft version of Alternative 3 was reviewed by several of the individuals and groups that provided significant input during the scoping period. A meeting and field trip to the project area on July 28, 2016 was attended by these individuals and groups. One of the attendees of the meeting and field trip was a representative from the University of Georgia who is interested in a research project regarding the effects of this project on ruffed grouse and migratory songbirds.

Alternative 3 was modified following this meeting to incorporate feedback from representatives of Georgia ForestWatch, the Ruffed Grouse Society, and the University of Georgia.

Issues considered but eliminated from detailed analysis

Evaluation of the proposed action indicated effects on the following would not vary between alternatives and/or there would be very little to no effect on these resources. Therefore, the following is not covered in detail in the EA, but are discussed briefly below to add to the overall understanding of the proposed action and alternatives. Technical reports with additional information are available in the project record (Project Record is available for review at the Conasauga RD in Chatsworth, GA).

Heritage Resources

The area analyzed for heritage resources includes all National Forest lands which may be affected by project activities associated with any of the alternatives considered (Area of Potential Effect). The "area of potential effect" is the geographical boundaries within which there is reasonable and foreseeable potential for heritage resources or their setting to be directly or indirectly affected by the undertaking.

Archeological surveys have been conducted in the Fightingtown Creek project area over the last 20 to 30 years. A total of 16 recorded sites exist within proposed treatment areas. Of these, 13 have been found to be ineligible for National Register of Historic Places and three sites have an undetermined status. These three sites would require protection pursuant to guidelines established by the Chattahoochee-Oconee National Forest's Heritage program and Georgia State Historic Preservation Officer (SHPO) and Eastern Band of Cherokee Indians Tribal Historic Preservation Officer (THPO) consultation.

If an adverse effect to a cultural resource is noted, the Forest Service is compelled to mitigate those adverse effects in keeping with 36 CFR 800, and Forest Service Manual (FSM) 2360: Heritage Program Management.

Since there are no direct or indirect effects to heritage resources, consequently, there will be no cumulative effects resulting from the proposed action or any of the alternatives. The Heritage Resources Report is available in the project record.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Fightingtown Creek project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e. harvest methods, design criteria) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (the acres of treatment, the miles of road reconstruction or maintenance).

Alternative 1 – No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No timber harvest or associated road reconstruction or maintenance would be implemented to accomplish project goals. No small blocks of old growth would be designated.

Alternative 2 - The Proposed Action

Even-aged regeneration harvest – Approximately 436 acres (17 stands) are proposed for a combination of commercial and noncommercial timber harvest utilizing even-aged management, all within MRx 9.H (Figure 2). The majority of overstory trees in these stands would be removed, and the stands would be allowed to naturally regenerate. These stands are dominated by mesic deciduous hardwoods or white pine (*Pinus strobus*) and would likely regenerate to the same species. A portion of the trees (minimum of 15 ft^2 per acre) would be reserved from cutting. These trees would be retained in a non-uniform and variable distribution and would remain on site indefinitely. Long-lived species such as white oak (*Quercus alba*) would be selected as reserve trees to be retained. To manage species

composition within the regeneration, timber stand improvement treatments would be applied five years after harvest, and again as necessary to favor oaks and other desired species in the regeneration. Timber stand improvement treatments would include individual tree release using manual hand tools, such as chainsaws or brush-cutters.

The following stands are proposed for regeneration harvest:

Table 2. Stands proposed for regeneration harvest in the Fightingtown Creek project area.

Compartment	Stand	Current Forest Type*	Acres	Management Prescription
680	05	56	20	9.H
680	08	56	33	9.H
680	09	03	13	9.H
680	13	03	16	9.H
680	14	56	26	9.H
680	22	56	25	9.H
680	39	56	54	9.H
681	13	56	35	9.H
681	15	50	22	9.H
681	18	56	56	9.H
682	04	56	13	9.H
682	07	56	46	9.H
682	21	56	11	9.H
683	01	56	15	9.H
683	10	56	12	9.H
684	15	56	18	9.H
684	31	56	21	9.H
		Total	**436**	

*****Forest Type 03 = white pine
Forest Type 50 = yellow poplar
Forest Type 56 = yellow poplar-white oak-northern red oak

Old Growth Designation – Approximately 67 acres in the Little Fightingtown Creek watershed and 394 acres in the Fightingtown-McClure Creek watershed are proposed for designation as small blocks of future old growth (Figure 2).

Table 3. Stands proposed for old-growth designation in the Fightingtown Creek project area.

Compartment	Stand	Forest Type	Age (2016)	Old Growth Type	Acres	Management Prescription
Fightingtown Creek-McClure Creek, HUC# 060200030204						
676	13	53	134	21	30	12.A
676	14	53	134	21	37	12.A
676	18	53	134	21	35	12.A

678	10	53	121	21	48	9.H
679	03	03	154	02	81	9.H
679	05	53	153	21	32	9.H
679	06	03	156	02	07	9.H
679	07	53	156	21	12	9.H
679	09	03	121	02	13	9.H
679	10	53	153	21	19	9.H
679	12	03	123	02	29	9.H
679	28	32	109	24	51	9.H
HUC total					**394**	
Little Fightingtown Creek, HUC#060200030205						
681	11	53	136	21	39	9.H
683	18	53	134	21	28	9.H
HUC total					**67**	
Total					**461**	

Associated Road Activities–

Road Management: Selected Forest Service System roads in the project area were recommended for changes in management and maintenance levels in the draft Transportation Analysis Process/Report completed by the Forest in 2012. The following recommendations would be included in the proposed action for this project (Figure 2):

1. Revised objective maintenance level (ML) on FSR 797 (Hickory Nut Road) from ML 3 to ML 2. The road would remain open year-round but receive less frequent maintenance due to low use.
2. Revised use restrictions on FSR 796 (McClure Creek Road) and a portion of FSR 792 (Williamson Cove Road) from year-round to seasonal use. The approximate last mile of FSR 792 would be gated and the road beyond that point would be planted to a preferred seed mixture. The roadsides would be maintained with a side-arm mower or mulching head to increase daylight on the road surface. This gate would be opened during April through September; otherwise it would be closed for walk-in hunting access. FSR 796 would be open for vehicles from April – September.

Road Reconstruction: This activity includes minor reconstruction needed to widen segments of existing Forest Service System roads to improve access to the proposed vegetation management activities. Road reconstruction activities could include: widening of roadbed surface in curves, removal of vegetation in roadbed surface, improvement of drainage structures (culverts, lead-off ditches and rolling dips), spot surface placement of gravel, and erosion control.

Road Maintenance: Road maintenance activities would be conducted on segments of existing Forest Service System roads utilized for the vegetation management activities included in this proposal. Activities could include surface blading, brushing of roadside vegetation, spot placement of gravel, maintenance or improvement of drainage structures, and erosion control.

Forest Service Roads (or portions thereof) proposed for minor road reconstruction or maintenance are included in the table below:

Table 4. Forest roads proposed for treatment.

FS Road No.	Name	Mileage	Minor Reconstruction	Maintenance
792	Williamson Cove	4.5	Yes	Yes
797	Hickory Nut Gap	3.0	Yes	Yes
796	McClure Creek	2.2	Yes	Yes
798	Porter Mountain	0.8	Yes	Yes
	Total	**10.5**		

Temporary Access: An estimated 2.8 miles of temporary roads would be needed to gain access to the stands proposed for vegetation management activities. Of these, an estimated 1.4 miles would be considered new construction, while the remaining miles would be considered betterment of existing roadbeds established from previous management. Activities associated with temporary road construction could include: removal of vegetation, brushing of roadside vegetation, surface blading, spot placement of gravel, improvement or installation of drainage structures, erosion control (including reclamation of sites), and closure once harvest and associated activities are completed.

Alternative 3 – Partial Canopy Retention_____

This alternative was developed to address concerns expressed during the scoping period while still allowing for the creation of the desired habitat conditions described in the purpose and need discussion above. Specifically, this alternative was designed to consider the following:

- Loss of mature hardwood forest through regeneration harvests, and associated loss of mast production
- Loss of mature forest habitat for wildlife species not dependent on ESH
- Loss of potential oak regeneration

Wildlife habitat diversity would be created under this alternative by applying three timber harvest methods described in detail below (Figure 3).

Other aspects of this alternative are identical to those included under Alternative 2 (e.g. old growth allocation, associated road activities).

Timber Harvest

1. Two-Aged Regeneration – Partial Retention of Canopy

This harvest method would be applied in project area stands (Figure 3) where inventory data suggests mature oak represents only a minor component of the current overstory. These stands are dominated by yellow poplar and other cove hardwood associates. Oak species comprise from less than 5 percent up to 21 percent of the current stand stocking in areas where this method would be applied. Under this method, 25 percent of the existing overstory within the boundary of harvest units would be reserved from cutting by establishing full-retention aggregates (i.e. clumps of leave trees). In areas not reserved as aggregates, all merchantable trees would be harvested. This harvest method would create islands of mature forest within a matrix of clearings created for regeneration. Areas

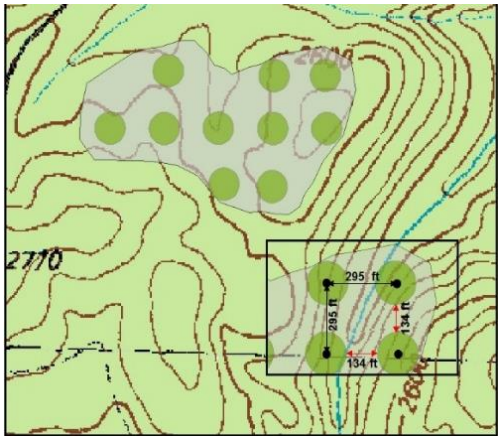
proposed for treatment under this method currently average from 108 to 162 ft^2/acre in basal area and would average from 27 to 41 ft^2/acre of basal area after treatment when aggregates and openings are considered. Species composition within the retention aggregates would be proportional to the current/pre-treatment species composition.
The number of retention aggregates to establish under this method would depend on the size of the harvest unit and the size of the individual aggregates to be reserved. For example, to reserve 25 percent of a 20 acre harvest unit, 5 acres of retention aggregates would need to be established within the unit in some manner. Multiple configurations of retention aggregates would be possible, but under this alternative the 25 percent overstory retention target would likely be achieved by the establishment of either:

1. one, **one-half acre** aggregate per two acres of treatment, <u>or</u>
2. one, **one-acre** aggregate per four acres of treatment,

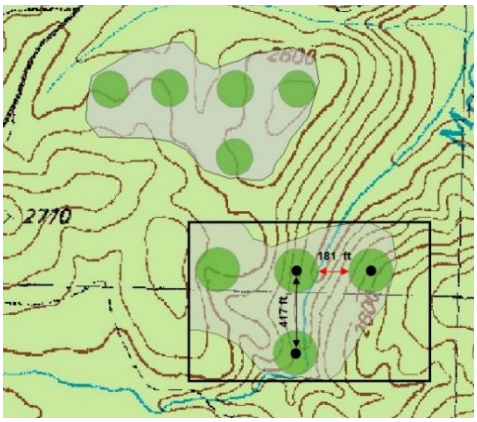
Aggregate boundaries would be irregularly shaped and somewhat evenly distributed throughout the harvest units. The one-half acre aggregates would be approximately 166 feet across (83 ft. radius), while the one-acre aggregates would be approximately 236 feet across (118 ft. radius). For a hypothetical 20 acre harvest unit, one configuration would produce ten, one-half acre aggregates and the other five, one-acre aggregates (Figure 4). Both configurations would result in 25 percent (or 5 acres) of the 20 acre harvest unit being reserved from cutting.

Under the two configurations of aggregates proposed under this alternative, aggregate centers would be spaced from 295 feet (Configuration #1) to 417 feet (Configuration #2) apart, creating from 134 to 181 foot wide openings between edges of mature forest aggregates.

Figure 4: Two likely configurations of retention proposed under Alternative 3:



A. Configuration #1 (1/2 ac groups)



B. Configuration #2 (1 ac groups)

These large openings would allow for shade intolerant species such as yellow poplar to regenerate. The moderated light environment created by aggregate edges would allow for species with intermediate shade tolerance to develop, including oaks. The full-retention aggregates of mature forest are not planned for later harvest and would be left on site indefinitely.

After treatment, sub-merchantable trees left unharvested within the matrix of openings would be slashed down to prepare the sites for natural regeneration. To manage species composition within the regenerating matrix, timber stand improvement treatments would be applied five years after harvest, and again as necessary to favor oaks and other desired species. Timber stand improvement treatments would include individual tree release using manual hand tools, such as chainsaws or brush-cutters.

The following areas would be treated under this regeneration harvest method:

Table 5. Stands to be treated by the partial canopy retention method.

Compartment	Stand	Acres	Forest Type*	Management Prescription
680	14	26	56	9.H
680	39	54	56	9.H
681	13	35	56	9.H
681	15	22	50	9.H
683	01	15	56	9.H
683	02	18	56	9.H
683	03	28	56	9.H
Total		**198[A]**		

* Forest Type 50 = yellow poplar; Forest Type 56 =yellow poplar-white oak-northern red oak
[A] This figure represents total stand acres; approximately 25% of each stand will be retained.

2. Two-Aged Regeneration - Shelterwood with Reserves

A two-aged shelterwood with reserves harvest method would be applied in cove hardwood stands where oak is more abundant, and where the selection of individual leave trees select oak for retention. Under this method, an average basal area of 25-40 ft^2 per acre would be reserved from cutting by selecting individual trees for retention. Oaks, den trees and other large trees with potential dens would be given preference as leave trees. Trees not selected for retention would be harvested, creating openings between leave trees for natural regeneration to occur and a two-aged condition to develop. Tree species likely to be harvested would include yellow poplar, red maple, white pine and other mesic-site hardwoods. Most oaks would be retained (from 40 up to 80 percent), but some would be harvested to create openings for regeneration.
Because oaks would be favored for retention, spacing between individual leave trees would vary according to the distribution of oaks within the harvest units. A non-uniform and variable pattern would result, with some areas void of leave trees and other areas with clusters of leave trees. Because the goal is to limit shading so that regeneration can occur, no

more than 40 ft^2 per acre of oak would be retained in any given area. Oak trees and other trees selected for retention are not planned for future harvest and would remain on site indefinitely. These trees would continue to provide mast and regeneration seed sources within the harvest unit. New regeneration forming between the reserve trees would create structural diversity and early-successional forest habitat for up to 15 years.
Following the regeneration harvest, sub-merchantable trees left un-harvested would be manually slashed down to prepare the areas for natural regeneration. To manage desired species composition within the regenerating areas, timber stand improvement treatments would be applied five years after harvest, and then again as necessary to favor oaks and other desired species. Timber stand improvement treatments would include individual tree release of desired species using manual handtools, such as chainsaws or brush-cutters.
The two-aged shelterwood with reserves regeneration method would be applied in the following project area stands:

Table 6. Stands to be treated by the two-aged shelterwood method.

Compartment	Stand	Acres	Forest Type*	Management Prescription
680	22	25	56	9.H
681	18	56	56	9.H
681	17	10	53	9.H
	Total	**91**		

Forest Type 56 =yellow poplar-white oak-northern red oak
Forest Type 53 = white oak-red oak-hickory

3. Even-Aged Regeneration Harvest

This regeneration harvest method would be applied in selected cove hardwood stands and in stands dominated by white pine. Under this regeneration method, the majority of overstory trees would be harvested to create a new even-aged cohort of regeneration within the harvest units. A minimum of 15 ft^2 per acre would be reserved from cutting. Trees left unharvested would be retained in a non-uniform pattern and left on-site indefinitely. Trees with dens (if present) and long-lived species such as white oak, chestnut oak and yellow poplar would be selected as reserve trees to be retained.
Following the regeneration harvest, sub-merchantable trees left un-harvested would be manually slashed down to prepare the areas for natural regeneration. Timber stand improvement treatments would be applied five years after harvest, and again as necessary to manage desired species composition. Timber stand improvement treatments would include individual tree release to favor oaks and other desire species. These treatments would be applied manually, using handtools such as chainsaws or brush-cutters.
Even-aged regeneration harvests would be applied in the following project area stands:

Table 7. Stands to be treated by even-aged regeneration harvest.

Compartment	Stand	Acres	Forest Type*	Management Prescription
680	05	20	56	9.H
680	08	33	56	9.H
680	09	13	03	9.H

680	13	16	03	9.H
682	21	11	56	9.H
683	10	12	56	9.H
	Total	**105**		

*Forest Type 03 = white pine; Forest Type 50 = yellow poplar;
Forest Type 56 =yellow poplar-white oak-northern red oak

Temporary Access: An estimated 3 miles of temporary roads would be needed to gain access to the stands proposed for vegetation management activities. Of these, an estimated 1.5 miles would be considered new construction, while the remaining miles would be considered betterment of existing roadbeds established from previous management. Activities associated with temporary road construction could include: removal of vegetation, brushing of roadside vegetation, surface blading, spot placement of gravel, improvement or installation of drainage structures, erosion control (including reclamation of sites), and closure once harvest and associated activities are completed.

Design Criteria

A variety of project design criteria were developed to reduce potential impacts the various alternatives may cause. These include specific Forest Plan standards or guidelines, Best Management Practices, or project-specific measures.

Table 8. Design criteria proposed for use in the Fightingtown Creek project.

Resource	Design Feature
Soil and Water	Temporary roads would be constructed on existing routes (old woods roads or skid trails) where possible to minimize the need for new temporary road construction.
	Temporary roads would follow the general contour as practical and will generally not exceed sustained grades over 10%.
	The travel way of temporary roads would generally not exceed 14-16 feet except at turnouts and landings.
	Drainage structures, such as outsloping and waterbars, would be installed along temporary roads when the use of the road is no longer needed.
	Once the temporary roads are no longer needed, they would be closed to normal vehicle traffic and so that illegal ATV use is discouraged. The closures may include such things as the installation of an earthen barrier, re-contouring, placement of logging debris along the road surface, or placement of boulders.
	Skid trails will be closed at their junction with landing sites by placing slash on the skid trail in order to discourage illegal ATV use.
	Log landings and skid trail locations would be evaluated and approved by the Forest Service prior to harvesting in order to ensure that they are placed in locations with adequate drainage and away from sensitive soils or riparian areas.
	Skidding and decking would be limited to designated and approved routes along ridges and gentle slopes to protect sensitive soils. Skidding would not be allowed on sustained slopes over 35%.
	Operation of ground-based equipment would only be allowed when soils are dry. Soil moisture would be assessed during harvest operations to determine periods when equipment should be halted to minimize compaction and rutting.
	Skid trails, log landings, temporary roads, or other areas of exposed soil, would be seeded and fertilized as soon as practical after harvest activities have been completed in order to restore vegetative cover and reduce the potential for erosion.
	Water bars would be installed on skid trails and temporary roads at the completion of the project to minimize the potential for erosion.

Resource	Design Feature
	Compacted soils on skid trails, temporary roads, and log landings would be ripped or tilled in areas of detrimental soil compaction to maintain soil quality standards and increase water infiltration.
	Sensitive soils discovered during timber sale layout would be protected by restricting access or activities in these areas.
Riparian Areas	Skidding would not occur within riparian corridors, except for at designated crossings.
Heritage Resources	Heritage resources subject to direct or indirect effects resulting from the activities associated with this project would be avoided and protected from project effects as needed.
	Heritage resource sites would have a minimum protective buffer of 50 feet as needed. The buffer would be marked on the ground and excluded from project activities.
Non-native Invasive Species (NNIS)	Significant infestations of NNIS along planned access routes would be pre-treated systematically within timber sale areas in order to prevent the spread of NNIS into new areas.
	Equipment cleaning would be required in order to minimize the spread of NNIS and to minimize the potential to introduce new NNIS to the area.
	Skidding through known populations of NNIS should be avoided, where possible, to reduce the potential for spread.
Vegetation Management	Even-aged regeneration harvests would be limited to 40 acres in size.
Rare plants	Known populations of TES/LR plants will be protected by placement of a buffer zone around them.
Visual Quality	Regeneration areas in or abutting deciduous or mixed forests must include a 50-foot zone along mature forest edges in which intensity of silvicultural treatment decreases, resulting in a transitional or feathered edge (FWS-007).
	Layout of regeneration areas would incorporate irregular-shaped boundary edges to minimize straight-edge effects and contrast between un-treated areas.
	Layout of regeneration areas would incorporate a no-harvest zone between unit boundaries and open Forest roads or private property (C682 St 1,2,3; 682 St 21; 684 St 31)
	Layout of regeneration areas by design would leave areas un-harvested along prominent ridge-lines and/or sites of higher elevation to reduce “sky-lighting” effects and to obscure areas of lower elevation in regeneration.
	Other measures to be applied to all alternatives to protect the visual quality of the Fightingtown project area are located in Appendix B of this EA.
Wildlife Habitat standards	No cutting of snags >6 inches DBH.
	In all silvicultural treatments, retention priority is given to the largest available trees with favorable characteristics as bat roost trees (yellow pines and oaks with crevices, cracks, or hollows).
	In even-aged regeneration, create 5 snags per acre if not present.
	In even-aged regeneration stands larger than 10 acres, maintain a minimum of 15 sq. feet of basal area. These can be arranged in clumps, corridors, or feathered edges.
	In stands over 10 acres treated as seed-tree or shelterwood with reserves, maintain a minimum of 20 sq. feet of basal area. Retain all trees within 20 feet of 5 snags per acre for windthrow protection and snag recruitment.
	All shagbark hickory trees would be retained.
	Protect known bat roosts from cutting or modification as long as suitable.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 9. Comparison of alternatives.

Table 9. Comparison of alternatives.	Alt 1 - No Action	Alt 2 - Prop Action	Alt 3 - Partial Canopy Retention
Effects to soil and water resources.			
Acres of detrimental ground disturbance (log landings, skid trails)	0	48	44
Miles of temporary roads	0	2.8	3
Effects to mature forest			
Acres of white pine forest affected	0	29	29
Acres of oak and oak-pine forest affected	0	0	10
Acres of cove hardwood forest affected	0	407	355
Effects to forest composition			
Acres of treatment resulting in forest type conversion.	0	0	0
Effects to ESH dependent wildlife			
Acres of partial canopy retention treatment	0	0	198
Acres of even-aged regeneration treatment	0	436	105
Acres of two-aged shelterwood treatment	0	0	91
Acres of ESH created	0	436	394
Effects to recreational access/experience			
Miles of FS roads in the project area proposed for seasonal closure	0	3.2	3.2
Old growth conservation			
Acres designated as small blocks of future old growth	0	461	461

ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

There has been little active management in the Fightingtown Creek project area in the recent past (10 years), or at present. The activities that have taken place or are planned to occur outside these Alternatives are listed in Table 10 below.

Table 10. Past, present, and reasonably foreseeable future actions in the Fightingtown Creek project area.

Watershed (HUC #)	Activity	Year	Acres/ Miles Affected	Past	Present	Reasonably foreseeable
060200030204 **Fightingtown Creek-McClure Creek**	NNIS Treatment					X
	System Road Maintenance (FSR 793-Bushy Head Road, FSR 797-Hickory Nut Road)	2012	7 miles 4 miles	X		X
	Decommissioning of a portion of FSR 796 (McClure Creek)	2015	1 mile	X		
	Reconstruction of a portion of FSR 796 (McClure Creek)	2015	2.2 miles	X		
	Closure of illegal ORV trails (in the vicinity of Cashes Valley Road, FSR 793-Bushy Head Road)	2012 2013 2015	3 acres 2 acres 5 acres	X X X		
060200030205 **Little Fightingtown Creek**	NNIS Treatment					X
	System Road Maintenance (FSR 792-Williamson Cove, FSR 797-Hickory Nut Road)	2012	4.5 miles 3 miles	X		X

	ROW Maintenance (FSR 792-Williamson Cove Road)	2012	4.5 mi	X		

Vegetation Resources

Effects to Forest Communities

Current Condition: The Fightingtown Creek ESH project area is dominated by dry/dry-mesic oak-hickory and cove hardwood forests. Combined, these forests account for over 75 percent of the acres within the analysis area. Dry/dry-mesic oak-hickory forest comprises slightly more than one-third of the project area. These forests occupy a gradient of sites within the analysis area, including xeric ridgetops and southern exposures to sub-mesic north facing upper and mid-slopes. White oak, chestnut oak, scarlet oak, black oak and northern red oak are common oak species found within the analysis area. Yellow pine species (Virginia and shortleaf pine) grow in mixtures with upland oaks on the harshest sites.

Cove hardwood forests comprise over 40 percent of the acres within the analysis area. These forests occupy the mid-lower slopes and sheltered coves within the analysis area. Yellow poplar, northern red and white oaks, and other cove hardwood associates (sweet birch, cucumber tree, basswood) are common species found on these sites. Eastern white pine and hemlock are also common associates in cove hardwood forests.
Conifer dominated communities are less frequent in the Fightingtown Creek ESH project area. White pine-dominated forests occupy 22 percent of the acres within the analysis area. These forests occur over a wide range of sites, growing on all aspects and at all slopes positions. Upland oaks, cove hardwoods, yellow pine species, and eastern hemlock are common associates in white pine forests.

Yellow pine dominated forests are essentially absent from the analysis area. Less than one percent (51 acres in one stand) of the forest is typed as yellow pine.
The current distribution of forest vegetation by forest type is given in Table 11 below:

Table 11. Current distribution of forest vegetation by forest type in the Fightingtown Creek ESH project area.		
Mesic Deciduous Cove Hardwoods		
Forest Type	Acres	Percent of Analysis Area
56-Yellow Poplar-White Oak-Red Oak	4,909	42%
50-Yellow Poplar	104	<1%
Dry Mesic Oak-Hickory Forest		
Forest Type	Acres	Percent of Analysis Area
42-Upland Hardwoods-White Pine	24	<1%
53-White Oak-Red Oak-Hickory	4,000	34.2%
White Pine Forests		
Forest Type	Acres	Percent of Analysis Area

3-White Pine	2,501	21.4%
10-White Pine-Cove Hardwood	86	<1%
Yellow Pine Forests		
Forest Type	Acres	Percent of Analysis Area
32-Shortleaf Pine	51	<1%

A mature, closed-canopy forest is present on 85 percent or nearly 10,000 acres of the Fightingtown Creek ESH project area (see Successional Stage Habitats). Interspersed within this matrix of mature forest, is a well-distributed network of immature, closed-canopy forest produced by even-aged timber management activities applied during the late 1960s through the early 1990s. These areas represent approximately 15 percent of the acres within the analysis area. Timber management has been inactive in this area since 1992 and no additional areas of young forest have been produced in almost a quarter-century.

Prior even-aged management practices (described above) have influenced species composition within these younger forest stands. Most notable is the reduced presence of oak. This is especially evident on the more productive, mesic sites and less true on drier sites. Forest growing on mesic sites harvested during this period were naturally regenerated to even-aged stands of nearly pure yellow poplar. Oaks are subordinate in frequency and canopy status to yellow poplar on many of these sites today.

The regeneration of oak stands on mesic sites has long been problematic (Loftis and McGee 1993). Successful regeneration of oak is highly correlated with seedling size prior to regeneration events – not number of seedlings (Sander 1972, Loftis 1990). In most oak stands growing on moderately productive sites, large, competitive oak seedlings are infrequent or absent. The lack of sizeable oak seedlings is often attributed to the presence of a dense shade-tolerant mid-story layer. This layer casts deep shade that suppresses the establishment and growth of oak seedlings into competitive sizes. Consequently, disturbances to the overstory of mature oak-dominated stands often release established shade-tolerant species or escalate the establishment of aggressive post-disturbance invaders, such as yellow poplar. It is likely that the lack of sizeable oak seedlings at the time of these earlier even-aged management activities is responsible for the reduced presence of oak in some of the immature stands in the project area.

Oak seedlings develop more proportionately under a moderate or partial light environment where both root growth and stem height are balanced (Gardiner and Hodges 1998). Such environments can be produced by reducing mid-story vegetation. Similar light environments are also observed at the interface of a closed forest and an opening (i.e. the edge). Such conditions allow for existing small oak seedlings to develop in competitive stature, while limiting the development of more aggressive shade-intolerant species such as yellow poplar. Large oak seedlings are more capable of competitively responding to a regeneration event or other canopy disturbance, and of replacing a parent overstory oak.

Stands created during this previous period of even-aged management range in age from 24 to nearly 50 years. Following typical growth patterns, canopies in these stands likely closed from 14 to 40 years ago, or when the stands were approximately 10 years in age.

As a forest canopy closes, stands enter a period of formation referred to as the stem exclusion phase (Oliver and Larson 1996). During this period, high stem density excludes the addition of new stems and induces mortality of existing stems through competition for limited growing space (self-sorting process). As individual stems or species exert canopy dominance, weaker individuals are relegated to the sub-canopy, and depending on their individual tolerances for shade, slowly drop out of the stand. It is during this very early stage of stem exclusion, brought on by closure of the forest canopy, that forest composition is set and shaped for decades.

Growing space freed by the density-induced mortality of weaker stems is quickly seized by surviving individuals, allowing for the canopy to remain closed. As competition for growing space continues, stem density is gradually reduced. Decreased stem density improves growing space and advances tree size among surviving individuals. This cyclical process can often last for decades, or even longer on more productive sites, where stem density is naturally higher. As the self-sorting process continues, tightly-bunched thickets of trees common during early stem exclusion are transformed to more moderately spaced trees of increasing heights and diameters.

This is not a degraded condition, but a natural process of stand development that occurs whenever a new cohort of stems is initiated. It occurs at all scales: from tree-fall gaps to larger openings caused by large-scaled disturbances such as regeneration harvests. In fact, many of the older stands within the project area initiated from the logging disturbances of the early 20th century prior to national forest ownership. These older stands also went through this period of self-sorting.

The difference, therefore, between the younger stands in the project area and many of the older stands is explained by time and not a lesser or degraded condition. It is also worth noting that many of the older stands in the project area, including those proposed for treatment under action alternatives, are still exhibiting signs of density-dependent mortality – the stem exclusion process. These stands are merely at a different point on the timeline of stem exclusion – that is, trees are larger and more moderately spaced. Moreover, less than a half-century ago, many of these older stands would have appeared similar in structure to the young stands of today – small trees, much more narrowly spaced. Likewise, the young stands of today, will appear similar in structure to these older stands within a few short decades as continued self-sorting produces fewer stems of larger sized trees.

Effects of Alternative 1 (No Action Alternative): No effects to forest composition would result from this alternative. Forest structure would remain similar to current conditions. Over time, immature even-aged forest produced during prior management would begin to develop more diverse structural characteristics.

Effects of Alternative 2 and 3: Both action alternatives were **designed to reduce effects to forest composition, by avoiding or limiting treatments that would result in changes to existing forest types.** Loss or conversion of oak-dominated forest types was especially emphasized during the design of the two action alternatives by selecting areas more heavily dominated by non-oak species (e.g. yellow poplar or white pine-dominated).

Alternative 2 includes 436 acres of even-aged regeneration harvests to create areas of early-successional forest habitats. Regeneration treatments would reduce overstories to a minimum of 15 ft^2 per acre (10-15 trees per acre) and would be applied across parts of 17 individual stands. Overstory oaks, if available, would be featured as leave trees in the regenerated stands and left on site indefinitely. No harvests are proposed within oak-dominated forest types. Proposed even-aged regeneration treatments by forest type are shown in Table 12 below:

Table 12. Acres of treatment by forest type proposed under Alternative 2.

Forest Type	No. of Stands	Treatment Acres	Weighted Average Percent Oak
3 – White Pine	2	29	20%
10 – White Pine-Cove Hardwood	0	0	---
32 – Shortleaf Pine	0	0	---
42 – Upland Hardwoods-White Pine	0	0	---
50 – Yellow Poplar	1	22	6%
53 – White Oak-Red Oak-Hickory	0	0	---
56 – Yellow Poplar-White Oak-Red Oak	14	385	25%
Total	17	436	

Under Alternative 2, approximately 93 percent (407 acres) of even-aged regeneration harvests would be applied in yellow poplar-dominated forest types (forest types 50 and 56), affecting 15 stands. Regeneration harvests applied in these areas are expected to produce even-aged stands similar in composition to the parent overstories. Yellow poplar would likely dominate the species composition in the newly regenerated areas. No change in forest type is expected from treatments proposed under Alternative 2 in currently yellow poplar-dominated stands.

Oaks are a minor and varied component of the parent overstory in the 15 yellow poplar-dominated stands. On a weighted average, oaks constitute six percent of stand stocking in the single forest type-50 stand proposed for treatment and one-quarter of stand stocking across the 14 forest type-56 stands included under Alternative 2 (Table 12). Within individual stands, oak stocking ranges from zero up to 59 percent (**C682 S07**), but is 20 percent or less of stand stocking in 11 of the 15 proposed stands. Stands where oak comprises more than 20 percent of stand stocking include: **C680 S22** (39 %), **C681 S18** (38%), **C684 S15** (43%) and **C682 S07** (59%).

Oak will likely share a similar, or slightly reduced share of stand stocking in the newly regenerated stands (25 percent or less). As previously described, oaks do not compete well on more productive sites unless seedlings of advanced size are present. Rapid invasion by yellow poplar seedlings would likely suppress existing oak seedlings of small stature. However, connected release treatments would enhance growing conditions for existing oak seedlings, and could improve the probability of oaks comprising a similar share of stand stocking by canopy closure.

Remaining even-aged regeneration harvests would be applied in white pine-dominated stands (29 acres, 2 stands). Like in the yellow poplar dominated stands, regeneration harvests are

expected to produce even-aged stands similar in composition to the parent overstory. White pine would likely dominate composition in the newly regenerated stands.

Oaks are a minor component in the parent overstory of the white pine stands. On a weighted average, oaks comprise approximately 20 percent of stand stocking across the two stands proposed for treatment. Oaks are expected to comprise a similar share of stand stocking in the regenerated stands (20 percent or less). Connected release treatments would enhance growing conditions for oak seedlings, where present, and could improve the probability of oaks reaching the canopy at the time of crown closure. No change in forest type is expected from treatments proposed under Alternative 2 in currently white pine-dominated stands.

Alternative 3 includes 394 acres of regeneration treatments, using a combination of harvest methods. Harvest methods were designed with consideration for reserving more mature forest canopy and for harvesting fewer mature oak trees. Additionally, two of the yellow-poplar dominated stands with a higher component of oak proposed for even-aged regeneration under Alternative 2 are not included under this alternative (**C682 S07** and **C684 S15**). With the exception of the one oak-dominated stand included under this alternative, oak comprises 20 percent of less of stocking, on a weighted average, across all stands proposed for regeneration under Alternative 3 (see Table 13 below).
Alternative 3 harvest treatments include: (1) even-aged regeneration cutting identical to Alternative 2 on 52 acres; (2) two-aged shelterwood cutting on 91 acres; and (3) two-aged regeneration cutting with leave trees reserved in aggregates or groups of various sizes on 251 acres. Under this alternative, treatments would be applied across parts of 16 stands.

Table 13. Alternative 3 regeneration harvest treatments by forest type.

Forest Type	No. of Stands	Regeneration Harvest Method			Weighted Average Percent Oak
		Even-Aged Acres	2-Aged SHWD Acres	2-Aged w/Groups Acres	
3 – White Pine	2	29	0	0	20%
10 – White Pine-Cove Hardwood	0	0	0	0	----
32 – Shortleaf Pine	0	0	0	0	----
42 – Upland Hardwoods-White Pine	0	0	0	0	----
50 – Yellow Poplar	1	0	0	22	6%
53 – White Oak-Red Oak-Hickory	1	0	10	0	50%+
56 – Yellow Poplar-White Oak-Red Oak	12	23	81	229	11%
Total	16	52	91	251	

Even-aged regeneration would be applied in four stands (52 acres) under Alternative 3. This harvest method was proposed for white pine-dominated stands (2 stands) and for certain previously harvested yellow-polar dominated stands less than 50 years old (2 stands). In white pine-dominated stands, regeneration harvests are expected to produce even-aged stands similar in composition to the parent overstory. White pine would likely dominate species composition in the newly regenerated stands. Oaks currently comprise 20 percent of

stocking in proposed white pine dominated stands (Table 13). Oaks would likely comprise a similar share of stocking in the newly formed stands, and connected release treatments would favor oak to increase their chances of surviving through crown-closure.

In the two yellow-polar dominated stands proposed for even-aged management under Alternative 3, regeneration harvests would likely produce even-aged stands dominated by yellow poplar. Most stems to be harvested in these areas are still small with high stump-sprouting probability. Because most existing stems are yellow poplar, it is expected that these stands would naturally regenerate to a similar composition as the current overstory, primarily from stump sprouts. Oaks are a very minor component in the two yellow-poplar dominated stands proposed for even-aged management under Alternative 3 (less than 10 percent). Young oaks have high stump sprout potential, and because of an established root system, would compete similarly with sprouting yellow poplars for growing space. Oaks regenerating from stump sprouting sources would likely re-occupy a similar share of the overstory in the newly formed stands (10 percent or less).
No changes to forest types are expected from even-aged regeneration harvests proposed in either white pine or yellow poplar dominated-stands under Alternative 3.
A two-aged shelterwood regeneration harvest would be applied in three stands (91 acres) under Alternative 3. This regeneration method was selected for yellow-poplar dominated stands with a higher component of existing oak (two stands) and for one oak-dominated stand suggested by a respondent during scoping. Under this harvest method, a component of overstory oaks would be selected as leave trees and reserved from cutting. Selected oaks would remain on site indefinitely and would continue to provide a source of mast in the newly regenerated stands.

In areas between leave trees, a new even-aged cohort would establish to form a two-aged condition. In the two yellow poplar dominated stands (**C680 S22** and **C681 S18** – 81 acres), this regenerating cohort would likely be dominated by yellow-poplar. Oaks currently comprise nearly 40 percent of stocking in these two stands, but would likely represent a smaller percentage of stand stocking within the regenerating cohort due to faster establishment and growth rates of yellow polar on mesic sites. A legacy of oak would remain on site in the form of selected leave trees, and connected release treatments could improve the regenerating status of oak within the new regenerating cohort.
The two-aged shelterwood treatment would also be applied in portions of one oak-dominated stand (**C681 S17** – 10 acres). This areas is less mesic than other hardwood-dominated areas proposed for regeneration under Alternative 3. The potential for oak to successfully regenerate on this site in openings between leave trees is higher. Oak is expected to compete within the regenerating cohort and comprise a similar share of stocking (50% or more) in the newly formed stand. Additionally, the retention of mature oak as leave trees, will contribute to a source of continued mast production until regenerating oaks reach mast-bearing age.

No changes to existing forest types are expected to result from the two-aged shelterwood harvests proposed in these three areas under Alternative 3.

A two-aged regeneration harvest with reserve groups would be applied to remaining areas proposed for treatment under Alternative 3. This regeneration method was designed to

reduce the harvest of mature forest by reserving 25 percent of individual treatment areas from cutting. Composition within reserve groups would be proportional to the current overstory composition in areas treated under this method. Between reserve groups of mature forest, a new cohort of regenerating forest would develop to form a two-aged condition. This regeneration harvest method would be employed across parts of nine stands (251 acres).

All nine stands proposed for this regeneration method are dominated by yellow poplar. Oaks comprise from zero to 21 percent of current stocking. Areas harvested between mature forest reserve groups would likely regenerate to a similar composition to the parent overstory. Yellow poplar would likely dominate the regenerating cohort. However, because this treatment includes the establishment of interior reserve groups, additional areas of "edge" would be created. Oaks establish and persist more readily under partial light environments, such as those created by edges. It is, therefore, more probable that oak seedlings could develop over the long-term along the margins and edges created by this treatment. Subsequent mortality to mature forest trees reserved in the interior groups could release persistent oaks, allowing them to dominate the regeneration cohort that would establish as reserve trees die.

No effects or changes to the current forest types in areas proposed for two-aged regeneration with reserve groups is expected.

In summary, effects to forest composition from proposed treatments included under both action alternatives would be negligible. Both alternatives were designed to reduce changes to forest composition, particularly oak-dominated areas, by selecting areas for treatment with fewer oaks. Both alternatives focus treatments in areas dominated by yellow poplar or white pine. Collectively, oaks comprise 25 percent or less of stocking, on an acreage-weighted average, in proposed stands across both alternatives (see Tables 12 and 13). Oaks would be slightly less effected by Alternative 3 because: (1) it excludes two stands with a higher proportion of oak; (2) adds an oak dominated stand where oak regeneration potential is higher; (3) and creates additional edge-environments (partial light) where long-term oak regeneration dynamics are favored.

Both action alternatives would affect forest structure by creating areas of young forest habitat, in an otherwise mature forest canopy. From 394 to 436 acres (minus portions of stands that are steep, inoperable, or otherwise retained) of open forest would result from proposed regeneration harvest under Alternatives 2 and 3, respectively. Areas regenerated under proposed alternatives would remain open for but a short time. As forest regeneration increases in openings, a forest canopy would develop, producing a dense, closed-canopy forest. This would likely occur within 10-15 years of the harvest treatments.

During this first 10 to 15 years, currently dense, closed-canopy forest from previous management entries would continue to develop as a function of stem exclusion processes. Tree density in these areas would be steadily declining while tree diameters and heights would continue to increase. Some of the older stands from these previous management entries would be approaching 65 years in age by the time canopies close in regenerated stands included under the action alternatives. These areas would begin exhibiting

characteristics (larger trees, more well-spaced) similar to mid-successional forests. Some overlap, and a general increase in the amount of acreage of forest in the early stem exclusion phase (when combined with existing areas) would result under both action alternatives. Alternative 3 would produce fewer acres though, and would also produce more structurally diverse forest canopies through two-aged shelterwood and reserve group prescriptions.

Cumulative Effects: Because no activities are proposed under the no action alternative, there would be no effects that could be combined with past, present, or reasonably foreseeable actions that could cause adverse cumulative effects to forest community composition in the analysis area.

Both action alternatives were intentionally designed to avoid or minimize conversion of forest composition by developing treatments only in areas where the potential for reproducing a post-harvest composition similar to the parent composition was high. Because of known problems with regenerating oak on mesic sites, oak dominated stands on mesic sites were not proposed for regeneration under either action alternative. Accordingly, forest composition in areas proposed for regeneration under both action alternatives is expected to remain similar to the pre-regeneration composition. Areas currently dominated by white pine are expected to naturally regenerate to white pine. Likewise, areas currently dominated by yellow poplar are expected to naturally regenerate to yellow poplar. Oaks are a minor and varying component within areas proposed for regeneration. It is expected that oak will comprise a similar share of stand stocking in regenerating cohorts upon canopy closure, and release treatments would target the release of oaks to ensure their survival through canopy closure. Additionally, alternative 3 includes elements that feature greater conservation of oak.

Previous timber management in the Fightingtown Creek ESH project area produced even-aged stands that now range in age from 24 to 51 years. The last timber management activity in this area was in the early 1990s. These earlier activities altered species composition on some sites, by reducing oak and increasing yellow poplar. This is most evident on mesic sites where oak is less able to compete with the more rapidly growing yellow poplar. On drier sites, oak competes well, and is well represented in these even-aged stands.

Reasonably foreseeable events that could likely affect forest composition and structure in the project area is the loss of hemlock due to hemlock woolly adelgid. Although changes in species composition are not totally understood, it is reasonable to expect that white pine, rhododendron and cove hardwoods that co-exist with hemlock will likely assume growing space provided from the loss of hemlock trees. No other future actions that could affect forest composition are planned within the Fightingtown Creek project area.

Because activities included under action alternatives are not expected to alter current forest composition, these actions should not have a cumulative effect when combined with effects to forest communities from past or reasonably foreseeable events (as described above).

Effects to Successional Stage Habitats

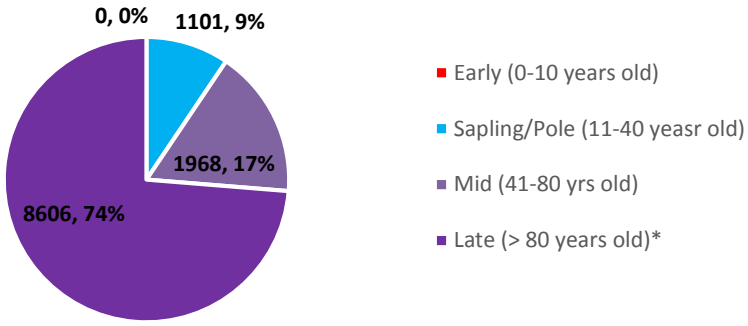
Current Conditions: The Forest Plan uses an age-based scale to separate forest succession into four stages based on structural characteristics and the associated habitat conditions these stages produce. The four stages include – early, sapling/pole, mid and late successional forest habitats. Early successional stage habitats (ESH) include regenerating forest from 0 to 10 years in age and are produced by even or two-aged regeneration cutting or by natural disturbances (windstorms, severe wildfire, insects/disease outbreaks). During this stage, forest stands are characterized by dense woody growth of regenerating trees and shrubs with a significant herbaceous component and a sparse or absent overstory of mature trees. This successional stage provides a number of important wildlife habitat attributes, including diverse food sources (forage, insect production, soft mast, and browse) and nesting and escape cover. These benefits are ephemeral and disappear quickly (10 years or less) as young forests develop and canopies close. A wide variety of wildlife species are dependent on ESH, and many species associated with late successional stage forests also use/depend on ESH during some portion of their life cycle. The reduction of timber management activities on national forest in the southern Appalachians has limited the supply of this habitat stage and a number of ESH-dependent species have suffered decline due to the limited availability of this important habitat condition (Hunter et al. 2001).

Once canopies close in an early-successional forest, the area succeeds to the sapling/pole successional stage. This stage includes stands from 11 to 40 years in age and is characterized by dense, closed-canopy forest with trees typically smaller than 10 inches in diameter. Habitat diversity is at its lowest during the sapling/pole successional stage. The closed-canopy conditions associated with this stage limits development of understory vegetation and trees have yet to reach seed-bearing maturity to provide stable supplies of wildlife food sources. This habitat stage does provide value as cover for certain wildlife species (USDA Forest Service 2004a).

Mid successional stage forest include stands from 41 to 80 years in age. Forests in this stage exhibit characteristics similar to the pole/sapling stage for several decades and then later function more like late successional forest as they mature and stratification of canopy layers become apparent. Forest stands in this stage provide habitat for many species that use late successional forest, but in general this stage of successional development provides lower quality habitat than forest in the late successional stage (USDA Forest Service 2004a).

Late successional stage forest include stands older than 80 years in age. During this stage, trees have attained larger diameters and stands begin to exhibit well-developed canopy layers and scattered openings caused by individual tree mortality. This stage includes stands that have or are approaching old-growth age-based criteria and may contain other old-growth habitat attributes. Similar to ESH forests, late successional stage forest offer a diversity of beneficial wildlife habitat features (high canopy nesting sites, roosting and foraging habitats, large diameter trees suitable for cavity development, and sources of hard mast and seed).

Figure 5. Current (2016) distribution (acres) of successional stage habitats within the Fightingtown Creek Early Successional Habitat analysis area.



The current distribution of these four successional stage habitats within the Fightingtown Creek Early Successional Habitat analysis area is shown in Figure 5 above.

Late successional stage forest is the prevailing habitat condition in the analysis area, comprising nearly three-quarters of the acreage in the Fightingtown Creek project (Figure 5). Individual stand ages in this successional stage range from 81 to 156 years old according to our corporate stand dataset. Nearly 4,800 acres (or 41 percent) of analysis area stands are 100 years or older. Some of these areas have reached or are nearing old-growth status based on old-growth criteria for minimum ages and the old-growth types present in the analysis area. The analysis of the old-growth resource in the project area is provided later in this document.

In contrast to the abundance of late successional forests within the analysis area, and due to the lack of forest management in the project area for more than two decades, areas of ESH forest are non-existent (Figure 5). Current stand-level data indicates that there are no acres of ESH. The youngest stands in the analysis area are 24 years old (base year 2016). These areas were regenerated to young forest during the last management entry in this area. Areas of ESH created 24 years ago would have succeeded to the pole/sapling successional stage in 2002 (14 years from the present).

The sapling/pole and mid-successional stage forests account for the remaining acreage in the analysis area (26 percent, combined). The sapling/pole (1,101 acres) and a component of the mid-successional forest (492 acres) represent the even-aged management activities in the analysis area post-1970 that once produced a well distributed network of ESH forest. A more substantial portion of the mid-successional stage forest (1,356 acres) is much older and will succeed to late successional forest over the next one to 13 years. Combining these areas with existing late successional forest, nearly 10,000 acres or 85 percent of the analysis area is in a mature forest condition.

All National Forest lands on the Chattahoochee-Oconee National Forests have been zoned into Management Prescription Areas (MRx), where the land and resources are managed to meet various uses, goals, and objectives. These Management Prescription Areas are identified and described in Chapter 3 of the Forest Plan (2004b). To ensure provision of the various successional stage habitats, the Forest Plan assigned different successional stage objectives to each MRx based on the management emphasis. Successional stage objectives for MRx contained within the Fightingtown Creek project area are presented in Table 14 below (current ranges are based on a base year 2016):

Table 14. Successional stages within the Fightingtown Creek project area by MRx.

MRx (acres in Analysis Area)	Early Successional Habitat (ESH)				Mid to Late Successional*			Late Successional*		
	Desired Range	Current	Desired Min	Desired Max	Desired Range	Current	Desired	Desired Range	Current	Desired
		-----Acres-----				-----Acres-----			-----Acres-----	
4.D (153 acres)	N/A	0	0	0	N/A	153	153	N/A	102	102
7.B (634 acres)	0-4%	0	0	10	75%	558	476	50%	391	317
8.E.3 (93 acres)	10-17%	0	9	16	20%	93	18	10%	93	9
9.H (8,531 acres)	4-10%	0	341	853	50%	7,591	4,265	20%	6,172	1,706
12.A (2,264 acres)	0-4%	0	0	91	75%	2,179	1,698	50%	1,848	1,132
11,675 ac TOTAL		0	350	970		10,574	6,610		8,606	3,266

*includes acreage of stands attaining minimum old growth age

The Forest Plan (USDA Forest Service 2004b) does not include desired successional stage habitat ranges for MRx 4.D, Botanical-Zoological. The inclusion of the existing acres by successional stage for this MRx in the table above is for reference only. No further discussion of successional stage habitat conditions in MRx 4.D is provided.

Both mid-late and late (alone) successional stage habitats exceed the desired ranges for all other MRx in the analysis area (Table 14). Collectively across all applicable MRx, the total amount of these successional stage habitats exceed the desired range by 3,811 (mid-late) to 5,238 acres (late, alone). Because there is no current ESH in the analysis area, the desired range for this successional stage habitat in all applicable MRx is below the minimum/maximum ranges specified in the table above (except where minimum range is 0 acres). A total ESH deficit of 970 acres currently exists within the analysis area. Differences between current and desired ranges of successional stage habitats are most pronounced in MRx 9.H, where existing late successional stage habitats exceed the desired range by 361 percent or 4,466 acres and the ESH deficit is 853 acres.

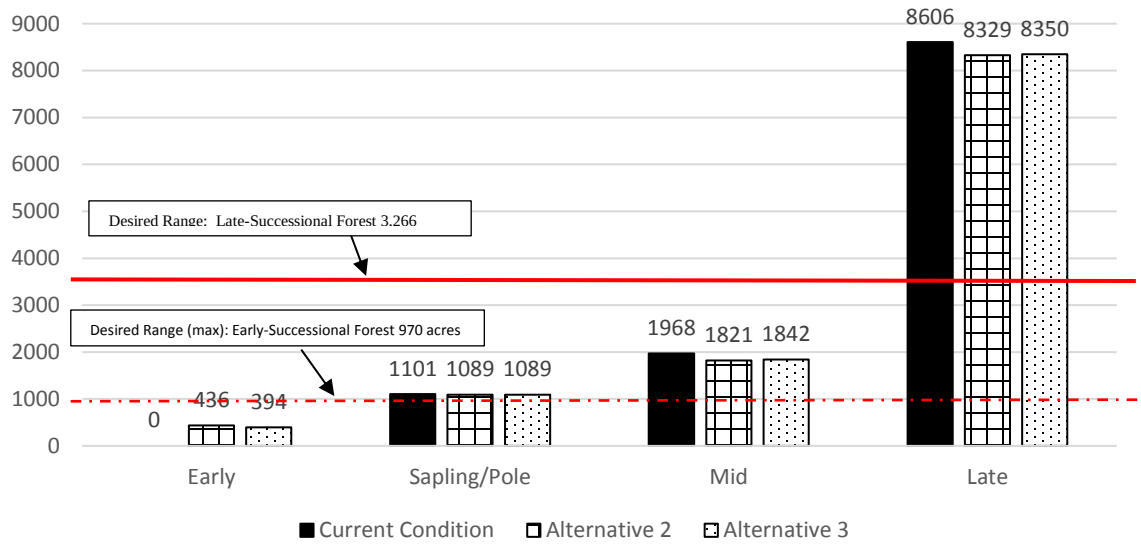
Effects of Alternative 1 (No Action Alternative): This alternative would perpetuate current conditions. The distribution of successional stages would continue to move towards late successional forest habitats, improving conditions for species associated with mid-late successional forests. No measureable amounts of ESH forest would be established, although fine-scale ESH attributable to storms and insect damage would steadily appear and disappear across the landscape.

Effects of Alternatives 2 and 3: The Fightingtown Creek ESH project analysis area is dominated by late-successional forest habitat (74%), with lesser amounts of earlier stage habitats and no ESH. Goal 2 of the Forest Plan includes direction that a diversity of habitat conditions, including ESH, will be provided for the full range of native and other desirable species. Both action alternatives would directly affect the current distribution and diversity of successional habitats in the analysis area by creating ESH.

A fact to be noted is that this assessment assumes the treatment of the total stand acreage. In reality, there are portions of each stand which will be excluded from treatment because it is too steep, rocky, too near a stream or wet area, or contain protected plants or heritage resources.

Changes to the present distribution of successional stage habitats as a result of the two action alternatives is presented in Figure 6 below:

Figure 6. Changes in Successional Stage Habitats by Action Alternative



Under Alternative 2, 436 acres or 3.7 percent of the analysis area would be placed into ESH through even-aged regeneration harvest. Slightly fewer acres (394 acres/3.4 percent of analysis area) of ESH would be produced under Alternative 3 through a combination of even-aged and two-aged regeneration harvest methods. Both alternatives would improve the diversity of habitats available within the analysis area by producing a habitat condition currently absent from the successional stage distribution in the area. Levels of ESH produced under either alternative would still be well below the desired maximum acreage (970 acres) listed in Table 14 above.

ESH would be created at the expense of the other successional stage habitats in the analysis area, but changes in the distribution of these other habitats would be minor (Table 14). Both alternatives would reduce sapling/pole successional stage habitats by 12 acres (one stand).

Effects to late-successional stage forest would be insignificant, relative to the abundance of this habitat in the analysis area (Figure 5). Late-successional stage forest habitats would be reduced by 3.2 percent under Alternative 2 and by 3.0 percent under Alternative 3. A net loss of 277 and 256 acres of late-successional forest would result from proposed activities included under Alternatives 2 and 3, respectively. Late-successional stage forest would still be the prevailing habitat condition in the analysis area (71 percent).

Alternative 2 would reduce mid-successional stage forest habitats by 147 acres or nine percent. This would include 90 acres of older mid-successional forest and 57 acres of mid-successional forest more similar in structure to sapling/pole forest habitat. Slightly fewer acres of mid-successional stage habitat would be affected under Alternative 3 (126 acres). This would include 69 acres of older mid-successional forest and 57 acres of mid-successional forest similar to sapling/pole forests in structural characteristics. Combined, mid and late-successional habitats currently account for 10,574 acres or nearly 91 percent of the analysis area. Alternative 2 would reduce the acres of these combined habitats by 4.1 percent or 424 acres. Alternative 3 would reduce these habitats by 3.6 percent or 382 acres. Mid and late successional habitats would still comprise 87 percent or more of the acreage in the analysis area following either action alternative.

Over the next 10 years, late-successional stage forest habitats will increase by another 897 acres, as stands of mid-successional forest succeed to late-successional forest habitat. This gain in late-successional forest over the next decade is more than double the amount of acres that would be lost through the proposed alternatives included in this analysis during the same time period. By the year 2026, 9,503 acres or 81 percent of the analysis area will be in late-successional stage forest habitat. This marks a seven percent gain in late-successional habitat over the next 10 years after losses of this habitat from the proposed alternatives are considered.

All changes in successional stage habitats described above would occur within MRx 9.H, where the disparity between current and desired ranges of successional stage habitats are the greatest. Changes to the distribution of successional stage habitats within individual management prescriptions are presented in Table 15 (Alternative 2) and Table 16 (Alternative 3) below. Data for other MRx are presented in the two tables for reference only. No changes to successional stage habitats would occur under either action alternative in other MRx within the analysis area.

Table 15. Changes in the distribution of successional stage habitats by Management Prescription under Alternative 2.

	Early Successional Habitat (ESH)				Mid to Late Successional				Late Successional			
MRx	Current	Desired	Alt. 2	Adjusted Total	Current	Desired	Alt. 2	Adjusted Total	Current	Desired	Alt. 2	Adjusted Total
	---Acres---				---Acres---				---Acres---			
4.D	0	N/A	0	0	153	153	0	153	102	102	0	102
7.B	0	0-10	0	0	558	476	0	558	391	317	0	391
8.E.3	0	9-16	0	0	93	18	0	93	93	9	0	93

9.H	**0**	**341-853**	**+436**	**436**	**7,591**	**4,265**	**-424**	**7,167**	**6,172**	**1,706**	**-277**	**5,895**
12.A	**0**	**0-91**	**0**	**0**	**2,179**	**1,698**	**0**	**2,179**	**1,848**	**1,132**	**0**	**1,848**
TOTAL	**0**	**350-970**	**+436**	**436**	**10,574**	**6,610**	**-424**	**10,150**	**8,606**	**3,266**	**-277**	**8,329**

Table 16. Changes in the distribution of successional stage habitats by Management Prescription under Alternative 3.

	Early Successional Habitat (ESH)				Mid to Late Successional				Late Successional			
MRx	**Current**	**Desired**	**Alt. 3**	**Adjusted Total**	**Current**	**Desired**	**Alt. 3**	**Adjusted Total**	**Current**	**Desired**	**Alt. 3**	**Adjusted Total**
	---Acres---				**---Acres---**				**---Acres---**			
4.D	**0**	**N/A**	**0**	**0**	**153**	**153**	**0**	**153**	**102**	**102**	**0**	**102**
7.B	**0**	**0-10**	**0**	**0**	**558**	**476**	**0**	**558**	**391**	**317**	**0**	**391**
8.E.3	**0**	**9-16**	**0**	**0**	**93**	**18**	**0**	**93**	**93**	**9**	**0**	**93**
9.H	**0**	**341-853**	**+394**	**394**	**7,591**	**4,265**	**-382**	**7,209**	**6,172**	**1,706**	**-256**	**5,916**
12.A	**0**	**0-91**	**0**	**0**	**2,179**	**1,698**	**0**	**2,179**	**1,848**	**1,132**	**0**	**1,848**
TOTAL	**0**	**350-970**	**+394**	**394**	**10,574**	**6,610**	**-382**	**10,192**	**8,606**	**3,266**	**-256**	**8,350**

Both alternatives would increase ESH to within desired ranges specified in the Forest Plan for MRx 9.H – 5.1 percent (Alternative 2) and 4.6 percent (Alternative 3). ESH created under each alternative would be near the lower end of the desired range for this habitat condition in MRx 9.H The desired range for ESH for areas within MRx 9.H in the analysis area is from four to 10 percent (Table 14), or from 341 to 843 acres (Tables 15 and 16). Alternative 2 would reduce late-successional stage forest in MRx 9.H by 4.4 percent (net loss of 277 acres). Late-successional stage forest would be reduced by 4.1 percent (net loss of 256 acres) under Alternative 3. Late successional stage forest stage habitats would still account for 69 percent of the habitat acres in MRx 9.H (desired range 20 percent) under either alternative. Combined, mid and late successional stage forests would be reduced by 5.0 (424 acre net loss) and 4.5 percent (382 acre net loss) under Alternatives 2 and 3, respectively. These habitats would still account for nearly 85 percent (7,209 acres) of the habitat acres in MRx 9.H, an amount well above the desired range (50 percent or 4,265 acres).

Cumulative Effects: Because no activities are proposed under the no action alternative, there would be no effects that could be combined with past, present, or reasonably foreseeable future actions that could cause adverse cumulative effects to the successional stage habitats in the analysis area.

The diversity of successional habitats in the Fightingtown Creek ESH analysis area are disproportional to direction established in the Forest Plan. This condition is most evident in MRx 9.H, where mid and late successional stage forests exceed desired range by nearly 40 percent or 3,326 acres and acres of ESH are non-existent. Both action alternatives would improve diversity in the analysis area by creating from 394 (Alternative 3) to 436 (Alternative 2) acres of ESH through proposed even-aged or two-aged regeneration harvests. These activities would be limited to areas within MRx 9.H. Successional habitat distribution and diversity within MRx 9.H would be improved, although mid and late successional stage habitats would still be well above desired ranges. Neither action alternative would alter the current distribution of successional stage habitats in other MRx (4.D, 7.B, 8.E.3, or 12.A).

It has been 24 years since management activity last effected the successional stage habitats in the analysis area. Areas harvested during this last management entry have since succeeded

from ESH to the sapling/pole successional stage and are no longer contributing to habitat diversity goals for the Forest. Likewise, there are no reasonably foreseeable plans in the analysis area that would affect successional stage habitats in the future.

Eastern hemlock is a minor component of white pine and cove hardwood communities in the analysis area. Like elsewhere on the Forest, hemlock woolly adelgid has caused significant decline or mortality to existing hemlock in the analysis area. Continued decline and mortality will create small, fine-scale patches of ESH across the analysis area. These events are not expected to result in any appreciable changes in successional stage habitats, nor have a measurable cumulative effect to successional stage habitats in the analysis area when considered with activities proposed under Alternatives 2 or 3.

Effects to Old-Growth Communities

Current conditions: To meet Forest Plan goals and objectives related to old-growth conservation, each 6th level watershed (hydrologic unit or HUC) with at least 1000 acres of National Forest management should have a minimum of 5% of its acreage allocated to conserving existing old-growth, or providing for future old-growth. Currently, neither of the two Fightingtown Creek 6th level sub-watersheds (Fightingtown Creek, HUC# 060200030204 and Little Fightingtown Creek, HUC# 060200030205) contain sufficient amounts of old-growth or old growth-compatible MRx that meet this objective.

The Fightingtown Creek watershed contains 0 acres (0%) of designated old-growth or old-growth compatible MRx. Approximately 378 acres is needed to meet this objective in this 7,564 acre watershed.

The Little Fightingtown Creek watershed contains 153 acres of MRx 4.D (botanical-zoological area), which is an old growth-compatible MRx. This represents 3.6% of the Little Fightingtown Creek watershed. Approximately 55 acres is needed to meet the 5% threshold in this 4,164 acre watershed.

Within the total Fightingtown Creek project area (11,675 acres), there is an abundance of late-successional forest communities. Nearly 74% of the area (8,606 ac) is older than 80 years old. Of this amount, there are currently 760 acres that meet the minimum old-growth age according to their forest type and associated old-growth community type (OGTY). This minimum age ranges from 100 to 140 years old based on a stand's OGTY. In addition, 1,340 acres of the late successional community is nearing (within 20 years) old-growth minimum age.

The Forest Plan and Region 8 guidance on old-growth conservation direct the Forest to consider existing old-growth stands (those that meet the minimum age requirement, among other criteria) as the highest priority for designation as small blocks of old-growth to meet the 5% objective. This Forest Plan objective would be easily met in the two Fightingtown Creek watersheds due to the abundance of stands that meet or nearly meet old-growth minimum age.

Effects of Alternative 1 (No Action Alternative): The proposed action would not be implemented. Current conditions would continue. No additional old-growth designation would be made at this time.

Effects of Alternative 2 (Proposed Action):
Old-growth designation - This alternative would designate 67 acres in the Little Fightingtown Creek watershed and 394 acres in the Fightingtown Creek watershed for old-growth designation. This is a total of 14 stands and 462 acres (Figure 2). This would meet the Plan objective described above. The stands selected for designation were primarily selected due to their age (eleven meet the minimum old-growth age requirement, the other three are within 20 years of meeting it), but factors such as OGTY were also considered. The Region has given direction to give priority to OGTYs 02, 13, 24, and 25 because they are not well-represented in the Blue Ridge Mountains ecozone (USDA Forest Service 1997). Stands with obvious signs of human disturbance were not considered for designation.

Timber harvest – None of the stands proposed for treatment in this alternative meet or nearly meet (within 20 years) the minimum old-growth age requirement according to their OGTY. No existing old-growth would be affected by this alternative, and no old-growth or old-growth compatible MRx would be affected by this alternative.

Road use activities – These activities would not affect old-growth resources.

Effects of Alternative 3 (Partial Retention): This alternative would be identical to Alternative 2 regarding the effects to old-growth communities (Figure 3). The same stands would be designated as small blocks of old-growth. No existing old-growth would be affected by this alternative, and no old-growth or old-growth compatible MRx would be affected by this alternative.

Cumulative effects: There would be no cumulative effects from the No Action alternative.

There are no other actions in the project area that would affect old-growth communities when combined with either of the action alternatives.

Effects to Threatened, Endangered, Sensitive, or Locally Rare (TES/LR) Plants

Current conditions: A botanical survey of the stands proposed for treatment and the proposed temporary road locations in the project area was completed during June 2016. Several populations of TES/LR plants were documented in stands proposed for treatment or on roadsides in the project area.

1. *Isotria medeoloides* (small whorled pogonia), an orchid federally listed as Threatened under the Endangered Species Act of 1973. A single plant was found in the project area in 2006. This individual persists and was documented by the 2016 surveyors. This species occurs on upland sites in mixed deciduous or mixed deciduous/coniferous forests that are generally in second-growth or younger

successional stages. Light availability is likely a limiting factor for this species. There are approximately ten known extant populations of *I. medeoloides* on the Chattahoochee National Forest, all in the Blue Ridge Mountains ecozone.

2. *Panax trifolius* (dwarf ginseng), a perennial herb known from rich, hardwood forests. Georgia lists it as a species of special concern (only eight populations are known in the state); the Forest lists it as Locally Rare. A population of six individuals was documented in the vicinity of the above *Isotria*.

3. *Listera smallii* (Appalachian or kidneyleaf twayblade orchid) is a small orchid that occurs in shady rhododendron thickets near streams. It is a species of concern in Georgia, and the Forest Service lists it as Locally Rare. Only six populations are known in Georgia, all on National Forest, but only three are extant. A population of 20 individuals was documented in the project area.

4. *Coreopsis latifolia* (Broadleaf tickseed) is an aster that occurs in moist mountain coves, usually along trails or roads. Georgia classifies it as Rare, and it is listed as Sensitive by the Forest Service because of its somewhat narrow range in restricted habitats (rich, mesic forests at mid-high elevations). Some populations on the Chattahoochee National Forest number in the thousands and are benefitted by roadside disturbance that increases light. Numerous clumps (15-20) of this species are known to occur on the open segments of roadsides on FSR 792 (considered one population).

Effects of Alternative 1 (No Action Alternative): The proposed action would not be implemented. Current conditions would continue. The above plant populations would be unaffected.

Effects of Alternative 2 (Proposed Action): Species 1-3 listed above would be protected during timber harvest operations by the placement of a minimum 50 foot buffer zone around the populations. No timber harvest or skidding would take place within the buffers. Species 4 occurs on roadsides, and is benefitted by periodic mowing or other disturbance. Clumps of *Coreopsis latifolia* would be avoided if possible during the reconstruction of short segments of road.

Effects of Alternative 3 (Partial Canopy Retention): This alternative would be identical to Alternative 2 regarding the effects to TES/LR plants.

Cumulative effects: There would be no cumulative effects from the No Action alternative.

Periodic road and right-of-way maintenance activities have benefitted the *Coreopsis latifolia* population by decreasing woody plant growth and increasing sunlight to the road prism. There are no other actions in the project area that are likely to affect these TES/LR plant populations when combined with the action alternatives.

Effects to Non-Native Invasive Plant Species (NNIS)

Current conditions: A survey of non-native invasive plants along the system roads, within the stands proposed for treatment, and the proposed temporary road locations in the project area was completed during June 2016. Numerous populations of *Rosa multiflora* (multiflora rose) were documented along FSR 797, adjacent old logging roads, and some along a tributary to Little Fightingtown Creek. Small populations of *Ligustrum sinensis* (Chinese privet) and a single *Albizia julibrissin* (mimosa tree) were also found along FSR road 797. In addition, widespread occurrences of *Sericea lespedeza* (Chinese lespedeza) are located along most of the system roads in the project area.

Effects of Alternative 1 (No Action Alternative): The proposed action would not be implemented. Current conditions would continue. NNIS populations would potentially treated as funding permits.

Effects of Alternative 2 (The Proposed Action): Roadside NNIS infestations may be spread by heavy equipment activity or increased light as a result of road reconstruction or maintenance. The existing populations of *Rosa multiflora, Ligustrum sinensis,* and *Albizia julibrissin* would be evaluated and pre-treated by mechanical and/or chemical treatments if necessary to prevent spread. See the Design Features table for other actions related to controlling NNIS.

Effects of Alternative 3 (Partial Canopy Retention): This alternative would be identical to Alternative 2 regarding the effects to NNIS.

Cumulative effects: There would be no cumulative effects from the No Action alternative.

Other actions likely to effect NNIS in the project area are occasional road maintenance, which has the potential to spread NNIS, and independent treatment of NNIS populations unrelated to this project, dependent on funding. These activities combined with activities in the two Action alternatives would not cause any increase of NNIS infestations.

Soil, Water, and Climate

Effects to Soils

Current Conditions: The geographic boundary used to assess direct and indirect effects to soils is the activity areas or forest stands where treatments such as harvest operations and temporary road construction are proposed. In general, soils outside the boundaries of the activity areas are not expected to be directly, indirectly, or cumulatively affected by this proposal.

The following activities or disturbances could potentially affect soils through disturbance that can alter existing soil conditions:

- Felling commercial trees with felling machines
- Moving felled trees from stump to processing and loading areas – skidders
- Processing logs in loading areas – skidders, loaders, bulldozers, transport trucks

- Construction, maintenance, and closure of log landings, skid roads and temporary roads – bulldozers, dump trucks
- Maintaining permanent Forest Service system roads (including minor road reconstruction) – bulldozers, graders, dump trucks

These activities have the potential to cause detrimental soil disturbance that can directly impact soil quality and/or productivity through compaction, rutting, erosion, displacement, and loss of ground cover.

Two soil survey areas – Fannin and Union Counties (USDA Natural Resource Conservation Service 2016a) and Cherokee, Gilmer, and Pickens Counties, Georgia (USDA Natural Resource Conservation Service 2016b) - cover the project area. These surveys are available at the USDA Natural Resources Conservation Service, NRCS Web Soil Survey website (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm). It is notable that there is a significant difference in these two soil surveys. The latter survey is more grossly mapped and lacks the site-specificity found in the Fannin and Union County survey.

Table 17. Soil Series and Mapping Units in Proposed Treatment Stands in the Fightingtown Creek Project.

Soil Series Name	Soil Mapping Units	Erosion hazard, off-road	Soil rutting hazard	Harvest equipment operability	Proposed Treatment Acres	
					Alternative 2	Alternative 3
Soils 10-25% Slopes						
Bradson loam	BrE 10 to 25% slopes	moderate	severe	moderately suited	2	2
Clifton-Evard complex	ClE 10 to 25% slopes	moderate	severe	moderately suited	60	53
Saunook-Evard complex	SaE 10 to 15% slopes	moderate	moderate	well suited	45	53
SUBTOTAL					**107 (25%)**	**108 (27%)**
Soils 25-45% Slopes						
Ashe and Edneyville stony loams	AaE 25 to 60% slopes	severe	moderate	poorly suited	27	27
Chestnut loam	ChF 25 to 45% slopes	moderate	moderate	moderately suited	16	12
Cowee-Evard complex	CxF 25 to 45% slopes	moderate	moderate	moderately suited	98	131
Saunook-Evard complex	Snf 25 to 45% slopes	moderate	moderate	moderately suited	96	82
SUBTOTAL					**237 (54%)**	**252 (64%)**
Soils 45-60% Slopes						
Saunook-Porters complex	SpG 45 to 60% slopes	severe	moderate	poorly suited	15	5
Porters Loam	PsG 45 to 60% slopes	very severe	severe	poorly suited	11	0
Cowee-Evard complex	CxG 45 to 60% slopes	moderate	moderate	poorly suited	66	31
SUBTOTAL					**92 (21%)**	**36 (9%)**
TOTAL TREATMENT AREA					**436 (100%)**	**394 (100%)**

Survey information includes soil series descriptions, soil maps, interpretations for various management uses, and related soil use information. There are a total of 8 soil series and 10 soil mapping units within the proposed treatment areas. Soil series found in the proposed treatment areas are listed in Table 17, along with ratings for erosion hazard, soil rutting hazard, and harvest equipment operability.

Erosion hazard: The process of erosion is natural and occurs on all landscapes. In the southeastern United States, erosion occurs predominantly because of the interaction of water with soil. Soil may be permanently lost and soil particles leaving the site may result in sediment in nearby streams which would impact water quality and possibly compromise aquatic habitats. The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbances that expose 50 to 75 percent of the surface. A "Moderate" rating indicates that some erosion is likely and that erosion-control measures may be needed. A "Severe" rating indicates that erosion is very likely and that erosion-control measures, including re-vegetation of bare ground, are advised. A "Very Severe" rating indicates significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

To place these ratings in context, the following factors should be considered:

- Disturbances associated with timber harvest on National Forest lands in areas off roads or off trails do not normally result in 50 to 75 percent soil surface exposure, and areas where soil surfaces have been exposed are re-vegetated in conformance with Forest Plan standards and state Best Management Practices (Georgia Forestry Commission 2009).
- Slope of a site is a major influence on this rating. Typically harvest operations occur on slopes below 35 percent slopes. Portions of a stand with sustained slopes greater than 35 percent are generally excluded from harvest unit layout. Therefore, it is likely that no timber harvest operations would occur on soils in the 45-60% slopes and a portion of the 25-45% slope category.

Soil Rutting Hazard: The ratings for this interpretation indicate the hazard of soil rut formation through operation of forestland harvest equipment. Soil rutting generally occurs when operations are conducted during periods of soil saturation or wetness and/or high water table. Formation of ruts occurs when soil strength declines and is not adequate to hold up the weight of the vehicle load. This can disrupt the normal flow of water through the soil profile. Depth to water table, rock content in upper soil surfaces and slope variables are used to determine ratings under this interpretation. A rating of "Slight" indicates that the soil is subject to little or no rutting. A "Moderate" rating indicates that rutting is likely. A "Severe" rating indicates that ruts form readily. Most project area soils have a moderate or severe soil rutting hazard rating. Limitations for these ratings are due to soil strength. Conducting harvest operations during drier periods of the year, use of logging slash/debris on areas of heavy traffic, and use of logging vehicles with high-flotation tires can minimize rut formation on soils determined more susceptible to rutting and compaction.

Harvest Equipment Operability: Ratings for this interpretation indicate the suitability for use of forestland harvesting equipment. Soil properties, including slope, rock content in surface layers, soil texture, and depth to water table are the basis for the interpretative ratings. Standard rubber-tired skidders and bulldozers are assumed to be used for ground-based harvesting and transport. "Well Suited" ratings indicate that soils have features favorable for the specified management and have no limitations. Good performance can be expected, and little or no maintenance is needed. "Moderately Suited" indicates that the soils have features that are moderately favorable for the specified management. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. A "Poorly Suited" rating indicates that the soils have one or more properties that are unfavorable for the specified management. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. There are portions of two stands in the "poorly suited" category (the 27 acre value in Table 17). This is the southern-most portion of C680 stands 8 and 14, which lie in Gilmer County. The soil series with this rating (Ashe and Edneyville stony loams) was grossly mapped in Gilmer County and does not accurately describe the soils in this area. The average slope in these two stands is 22 and 23 percent, respectively, and soils are similar to those rated as better suited to harvest equipment. As described above, it is unlikely that timber harvest operations would occur on soils in the 45-60% slopes and a portion of the 25-45% slope category.

Regulatory Framework

The regulatory framework providing direction and guidance for protection of a soil's inherent capacity and productivity comes from the principle sources below:

- Organic Act of 1897
- Bankhead-Jones Act of 1937
- Multiple-Use Sustained-Yield Act of 1960
- National Forest Management Act of 1976
- Forest Service Manual 2500 , FSM 2250 – Soil Management
- Forest Service Handbook , FSH 2509.18, Region 8 Supplement, Chapter 2.2 - Soil Quality Standards
- Georgia's Best Management Practices for Forestry (BMPs), 2009
- Revised Land and Resource Management Plan, Chattahoochee-Oconee National Forests, 2004

The Forest Plan provides direction to maintain or restore soil productivity and quality (Goal 24). Forest-wide (FW) standards addressing soil productivity include FW-56, FW-058 through FW-063, and FW-065 through FW-068. These can be found on pages 2-21 and 2-22 of the Forest Plan. In summary, the standards identify the use of best management practices during project activities to avoid impacts to soils and to minimize the extent of detrimental soil disturbance to less than National and/or Regional standards (less than 15 percent of an activity area).

Effects of Alternative 1 (No Action Alternative): This alternative would result in no soil disturbing activities created by Forest Service timber management. Only natural erosion as

well as erosion associated with existing Forest Service system roads would be expected to continue within the project areas. Current levels of road use, along with regular maintenance would minimize erosion from these roads.

Effects of Alternatives 2 and 3: Proposed timber harvest treatments in the project area would have short- and long-term effects on forest soils due to varying degrees of soil disturbance. Impacts, however, can be minimized through project design features. Soil disturbance effects of concern (i.e. those that can cause detrimental disturbance) for the Fightingtown project include:

- **Compaction and soil rutting.** The potential for soil rutting in the stands proposed for treatment is rated as "moderate" in most areas (see Table 17). Soil compaction during equipment operations is most visible as soil rutting, or the creation of depressions from the vehicle tires. Compaction is typically greatest on temporary roads due to multiple passes. Approximately 2.8 miles of temporary roads would be necessary to implement the proposed action in Alternative 2; this is equivalent to 4.7 acres. Three miles of temporary roads (5 acres) would be necessary in Alternative 3 (Tables 18 and 19 below). The majority of these temporary road segments would be within treatment areas. Existing roadbeds would be utilized to the extent possible to decrease the need to create new temporary roads. In addition, locating access routes on well-drained terrain, conducting harvest operations during dry soil conditions, the use of rubber-tired skidders rather than tracked vehicles, and addressing soil rutting conditions when identified during operational periods have been included in the project's design features listed in Table 8.
- **Erosion and displacement.** Ground disturbing management practices influence erosion primarily because they remove vegetative ground cover and often concentrate and channel runoff water. Research has shown that transportation systems and associated impact areas of log decks and primary skid trails are the most common causes of accelerated erosion that occurs in forested watersheds (Gucinski et al. 2000). Approximately 16 log landings (totaling about 4 acres) would be necessary to implement the proposed action in Alternative 2; 18 landings (4.5 acres) would be necessary in Alternative 3. The erosion hazard rating for the majority of the proposed treatment areas is "moderate", which indicates that some erosion is likely but that standard erosion control measures such as installing water bars plus seeding and fertilizing roads or skid trails, and not exposing more than 20 to 30 percent of mineral soil in treatment areas, are sufficient to prevent excessive erosion. Surface exposure is usually confined to log landings, segments of skid trails nearest to log landings, and temporary roads. This project also contains several design features (Table 8) intended to reduce the risk of soil erosion in treatment areas, including: (1) slope limitations for harvest units, skidding, and construction of temporary roads; (2) re-vegetation standards for areas of exposed soil; and (3) construction of water-diverting structures on skid trails and temporary roads; and (4) rehabilitation and closure of skid trails, landings, and temporary roads once project activities are completed. Areas with "severe" ratings are typically located above 35% slopes and would not be treated.

These disturbances would occur in harvest units where landing, skid trails and temporary roads are constructed. Alternative 2 proposes to conduct silvicultural treatments on 436 acres. Table 18 illustrates that approximately 11.90% of this acreage would be affected by ground disturbance. This is less than the 15% threshold established by National and Regional standards. However, in reality on the ground, there are portions of each stand that are too steep or otherwise not accessible and these portions would not be laid out as timber sale units, and no ground disturbance would occur in these areas. The total acres of ground disturbance is likely to be 40-45 acres, or less than 10% of the treatment area.

Table 18. Acres of Ground Disturbance – Alternative 2.

Activity	Number of Sites or Miles	Assumptions	Acres of Soil Impacted
Log Landings	16	0.25 acre per landing	4
Temporary Roads	2.8 miles	14 foot wide road bed and shoulders	4.7
Skid Trails	Average 10% of treatment area	Skid trails not bladed, trees removed from corridor	43.6
Total Acres of Ground Disturbance			**52.3**
Percent of Project Area (treatment units)			**11.90%**

The majority of soil disturbance would occur on skid trails (83 percent of the predicted soil disturbance). Impacts to soils from skid trails would primarily occur from overland travel by skidders, with minimal to no blading or excavation of soils during skidding operations. Trees are removed from skid trails to form corridors for transporting felled trees to log landing locations. On most skid trail segments, skidding traffic occurs in two to three passes resulting in minimal exposure of the soil surface. Primary skid trail segments, those leading directly to the landing, receive multiple passes during skidding operations and often result in exposure of the soil surface to some degree. However, logging slash produced at landings are distributed over these areas during skidding operations, reducing areas of soil exposure and the potential for soil erosion caused by overland flow. Placement of slash also protects the soil surface from compaction from skidding traffic by providing a buffer between the soil and the wheeled vehicle. On steeper slopes where logging debris is inadequate to divert water and prevent soil movement, some excavation of soils is necessary to construct water-bars once skidding operations are complete. Exposed soils from water-bar construction are promptly re-vegetated to prevent soil loss.

Other effects to soils from proposed vegetation management activities includes loss of biomass and potential loss of nutrients from commercially harvested sites. Timber harvest operations remove biomass and site organic matter and thus affect nutrient cycling. Generally, nutrient losses are proportional to the volume of biomass removed from a site. Nutrients are lost during harvesting by removing the stored nutrients in trees, and additional nutrients are lost if the litter layer and woody debris are removed, more common in whole

tree harvesting systems. The harvest operations associated with Alternative 2 and 3 would involve removal of the tree stem only rather than the whole tree. The remainder of the biomass (leaves, needles, limbs) would stay on site, thus reducing nutrient loss.

Johnson and Curtis (2001) found that, on average, forest harvesting in North America had little or no effect on soil carbon (C) and nitrogen (N). Concentrations of C and N may have a slight decrease within the first year of harvesting but is not substantial or prolonged (Knoepp and Swank 1997). Nutrient loss in all cases is eventually replaced by soil weathering and natural inputs (Pritchett and Fisher, 1979). Although nutrients are replaced, cutting alters the processes that regulate nutrient cycling, which frequently accelerates nutrient leaching and loss in dissolved form. However, the soils on the forest have sufficient levels of nutrients including nitrogen, phosphorus and potassium to maintain soil productivity and vegetation often responds with rapid growth after treatment.

Table 19. Acres of Ground Disturbance – Alternative 3.

Activity	Number of Sites or Miles	Assumptions	Acres of Soil Impacted
Log Landings	18	0.25 acre per landing	4.5
Temporary Roads	3	14 foot wide road bed and shoulders	5
Skid Trails	Average 10% of treatment area	Skid trails not bladed, trees removed from corridor	39.4
Total Acres of Ground Disturbance			**48.9**
Percent of Project Area (treatment units)			**12.40%**

The amount of detrimental ground disturbance is slightly lower in Alternative 3, and is less than the 15% threshold within the treatment areas. As described above, the acreage of ground disturbance is likely to be somewhat less than projected due to the exclusion of steep and/or inaccessible portions of stands, and in Alternative 3, 198 acres are proposed for partial canopy retention. One-quarter of the stands proposed for this would be unaffected by ground disturbance.

Alternative 2 and 3 also include road maintenance and/or reconstruction activities on Forest Service system roads. All Forest Service system roads built in the past have a lasting effect on soil productivity due to compaction and displacement. Their maintenance for recreation access, fire-control and vegetation management requires on-going use, which results in compaction and displacement throughout the project area. There are approximately 10.5 miles of roads or road segments identified for use in the project area. Most of the system roads proposed for use/access need routine maintenance work, e.g. blading of the roadbed, clean-out of ditches and culverts, and spot surfacing with gravel. Additionally, some segments of roads need minor re-construction work, which could include widening of road bed surface in curves and replacement of under-sized culverts that do not meet current BMP standards. Such work would occur within the already disturbed road prism, and would not result in additional disturbance outside the road template. Road maintenance and

reconstruction activities may increase short-term erosion and sediment movement from road surface runoff but should be minimal, especially in road segments that occur at upper slope landscape positions, that are low in surface gradient, and that have adequate buffer distances between stream channels. BMPs for erosion control would be applied in areas of road reconstruction adjacent to streams by using siltation barriers and applying seed, fertilizer and mulch to bare soils. Routine road maintenance activities could include surface blading, spot placement of gravel, brushing of vegetation on cut or fill slopes, and repair/maintenance of drainage structures (ditches, dips, culverts). These activities typically improve drainage of the road surface and decrease erosion from water channeling down the road surface in the long-term.

Cumulative effects: Past, present, and reasonably foreseeable future actions in the project area are displayed in Table 10. Activities with the potential to affect or have affected soils in the past 10 years are limited to ongoing system road maintenance, consisting of road grading, the periodic addition of gravel, and cleaning out ditches and cleaning out culverts. There are no detrimental effects to soils that when combined with the effects of Alternatives 2 and 3, might cumulatively result in adverse effects.

Effects to Aquatic Resources

Current conditions:

The project area is located on national forest land in two 6th level sub-watersheds (Fightingtown Creek-McClure Creek, HUC# 060200030204 and Little Fightingtown Creek, HUC# 060200030205) (see Figure 1). Fightingtown Creek and its tributary McClure Creek are in the southern watershed; McClure Creek is the only stream in the vicinity of project activities. A series of waterfalls separates the flat headwater portion from the lower section. Sand and silt are visible in the pools. Little Fightingtown Creek and its tributaries Buck Creek, Polecat Branch, Devils Den Branch, and Williamson Cove Creek are streams in the northern half of the project area near proposed activities. They are small, clear, cold streams with bedrock riffles and sandy pools. They flow within steep, narrow drainages which rapidly lose gradient when they leave national forest land.

These streams are some of the headwaters of Fightingtown Creek, a large stream over 60 miles in length which flows into the Ocoee River north of the Tennessee state line. The Ocoee is known as the Toccoa River in Georgia. Fightingtown Creek and the Toccoa River are part of the massive Tennessee River system. The Tennessee River system's rich aquatic fauna is influenced by the basin's diverse geology and hydrography. Aquatic diversity declines as streams become smaller, less productive (lower pH), and colder. Fish diversity is naturally low in the small headwater streams, and sculpins (*Cottus* sp.), creek chubs (*Semotilus atromaculatus*), and assorted shiners (*Notropis* sp.) and darters (*Etheostoma* sp.) are the most commonly encountered species. Eastern hellbenders (*Cryptobranchus alleganiensis*), listed as Threatened in Georgia, are known from various Fightingtown Creek locations. A hellbender was recently reported by an angler on McClure Creek (Shepherd Howell, pers. communication). This occurrence is an indicator of good water quality (Jensen et al. 2008).

In addition to the native aquatic species, Fightingtown Creek is a popular rainbow trout (*Salmo gairdneri*) fishing destination. Fightingtown Creek and its tributaries are listed as Primary Trout Streams (i.e. self-sustaining rainbow, brown, or brook trout populations) (Georgia EPD website 2016). Multiple trout habitat improvement structures were built on Devils Den Branch and Polecat Branch by the Forest Service in the 1980s, and subsequent electrofishing surveys demonstrated their value in increasing rainbow trout production. No brook trout are currently known to exist in the Fightingtown Creek project area.

Sedimentation, and to a lesser extent, increased water temperatures and nutrient loading are the potential effects of timber harvest operations on water quality. The impact of all these parameters can be reduced or eliminated with proper planning and BMP implementation (Vose and Ford 2011). Sedimentation to streams occurs primarily as a result of erosion from roads and skid trails associated with logging. Sedimentation can be a major environmental stressor of stream ecosystems (Longing et al. 2010). Fine sediments, in excessive amounts, can act as pollutants or alter the physical characteristics of streams by embedding spaces between rocks, filling pools, and otherwise affecting the suitability of a stream as habitat for aquatic fauna (Wood and Armitage 1997). Forests provide excellent filters and are effective in protecting water quality; however, sediment from unpaved forest roads can affect aquatic habitat in localized areas after heavy rains. Unpaved roads have been found to account for more than 80% of stream sedimentation in the forested lands in the Southeastern United States (Riedel and Vose 2003), and stream crossings are the most likely locations for sediment delivery. The perennial streams in the project area are crossed by culvert pipes on FSR 792 (Buck Creek, Polecat Branch, Devils Den Branch, Williamson Cove), and on FSR 796 by one low-water ford (McClure Creek).

Stream temperatures may be impacted by timber harvesting if the forest canopy is removed adjacent to a stream (Vose and Ford 2011), but maintaining a riparian buffer reduces or eliminates this effect (Clinton 2011).

Water chemistry may also be affected by timber harvesting, but increases in nutrient concentrations are generally small and have little or no impact on water quality due to rapid re-establishment of vegetation (Vose and Ford 2011). This is one of the reasons BMPs stress ensuring sites are revegetated quickly.

Geologic structure influences water chemistry, drainage basin patterns, hydrology, slope, and streambed character; this in turn influences the distribution, abundance, and productivity of stream flora and fauna. High gradient mountain streams of the southern Blue Ridge physiographic province are inherently low in productivity (low in pH, nutrients and base cations) (Hackney et al. 1992). Additional stream acidification due to fossil fuel burning and its resultant air pollution is a serious problem in much of the Appalachian region, especially in higher elevations. Pollutants can be deposited on forest vegetation and soils as dry deposition, as liquid when it rains or snows (also called acid rain), or when fog or clouds intercept the landscape, especially the tops of mountains. This third type of acid deposition can be far greater than from dry deposition or rainfall and snow (National Park Service 2009). The deposition of acid compounds (especially sulfur compounds) for a long period of time or in high concentrations can impact forest nutrient cycling of base cations. Excessive

removal of base cations from forest soils can lead to unhealthy vegetation and poor water quality for aquatic biota (USDA Forest Service 2014).

This situation is being monitored throughout the region. Over 600 water samples taken across the Forest during 2012-2014 included several samples within the Fightingtown Creek project area (Table 20). These samples were gathered to establish a water chemistry baseline of CONF streams regarding possible acid deposition of sulfates and nitrogen from air pollution. The results of the water sample analysis included values for water pH and acid neutralizing capacity (ANC). These values are important indicators of ecological health. The ANC value is a measure of stream water's ability to neutralize strong acid or buffer the effects of acidification. For freshwater systems, ANC concentrations are grouped into five major classes: Acute concern (less than 0 meq/L, Severe concern (0-20 meq/L), Elevated concern (20-50 meq/L), Moderate concern (50-100 meq/L), and Low concern (>100 meq/L). These classes are based on the positive relationship between ANC values and ecological attributes, including diversity and species richness. The number of fish species present in an aquatic ecosystem tend to peak at ANC values above 100 (National Park Service 2009). Lethal effects on most fish populations and macroinvertebrate communites are expected when ANC< 0 meq/L.

Table 20. Water sample results from streams in the Fightingtown Creek project area.

FS Sample ID	Monitoring Site Name	Time Sampled	Sample Date	Detect Limit mg/L:	
				pH	ANC or Alkalinity uE/L
	HUC# 060200030204				
14GA1106	Dillard Branch	11:15	05/06/14	5.5	51.8
14GA1108	Burnett Branch	11:56	05/06/14	5.6	62.9
14GA1107	Trib to Fightingtown Creek 1	11:40	05/06/14	5.6	51.8
14GA1109	Fightingtown Creek 2	12:18	05/06/14	5.6	52.4
14GA1111	Trib to Fightingtown Creek 3	12:58	05/06/14	5.6	51.8
14GA1113	Fightingtown Creek 4	14:21	05/06/14	5.6	62.9
14GA1112	McClure Creek	13:40	05/06/14	5.5	59.2
	HUC# 060200030205				
14GA1086	Buck Creek	1437	04/03/14	5.7	62.9
14GA1088	Polecat Branch	1005	04/09/14	5.6	44.4
14GA1089	Postelle creek	0824	04/09/14	5.6	51.8
14GA1093	Little Fightingtown	13:40	04/16/14	5.2	25.2
14GA1094	Trib to Little Fightingtown	14:34	04/16/14	5.2	24.3
14GA1090	Watson Creek 1	10:10	04/21/14	5.8	38.8
14GA1091	Watson Creek 2	10:57	04/21/14	5.9	42.1
14GA1095	Trib to Watson Creek 3	11:31	04/21/14	5.7	36.4
14GA1092	Williamson Cove	12:53	04/21/14	5.8	37.5
14GA1096	Devils Den Branch	12:32	04/21/14	5.9	42.3

The Fightingtown Creek project area stream values indicate that streams are inherently acidic and buffering capacity is marginal. Several of the samples returned ANC values in the Elevated Concern range (20-50 meq/L). This is primarily due to the higher order streams (extreme headwaters) which are located on national forest land; these are naturally more acidic and have lower buffering capacity. Whether these values are lower than pre-industrial levels due to acid deposition is unknown.

Regulatory framework

In order to protect water quality and aquatic habitats, activities on the CONF must comply with state and federal laws and the Forest Plan:

1. The federal Clean Water Act, Section 404 (40 CFR Part 232.3) requires the use of best management practices (BMPs) and other provisions related to forestry activities. BMPs are practices which are proven to protect the physical, chemical, and biological values of state waters by minimizing soil erosion and sedimentation (Georgia Forestry Commission 2009).
2. Georgia BMPs refer to "streamside management zones" or SMZs to describe the areas adjacent to perennial and intermittent streams and other bodies of water. Trees and other vegetation in the SMZ provide shade that protects water temperatures; woody debris vital to aquatic habitats; natural filtration of sediments and other pollutants; and travel corridors and habitat for wildlife. The minimum width of the SMZ for trout streams is 100 feet (each side). Activities within the SMZ must be conducted so as to maintain natural water temperatures and minimize turbidity. On Primary trout streams no elevation of natural stream temperatures is permitted (Georgia EPD 2014) 391-3-6-.03)
3. The Forest Plan includes direction on the management of 'riparian corridors' and silvicultural activities (including actions associated with them) conducted within the riparian corridor must be conducted to meet or exceed compliance with the current state BMPs (Forest Plan standard FW-070). Riparian corridors on the Forest are a minimum of 100 feet on each side, depending on slope. Only minor, temporary disturbances are allowed within the riparian corridor. For a list of design features that pertain to the protection of aquatic habitats and riparian corridors in this project area, see Table 8 (Design Features).

Aquatic habitats within the Fightingtown Creek project area are in good condition overall due to the forested landscape. None of the streams in the Fightingtown project area are listed by Georgia EPD as impaired (not meeting their designated use, which is fishing).

Effects of Alternative 1 (No Action Alternative): The proposed action would not be implemented. Current conditions would continue.

Effects of Alternative 2 (The Proposed Action): The majority of the activities included in this alternative would have little direct effect on aquatic habitats and associated biota because they would occur outside of the riparian corridor and would not directly impact streams, aquatic biota, or riparian vegetation.

Activities outside the riparian corridor could potentially result in indirect effects to aquatic systems from ground disturbance associated with the commercial timber harvest operations.

Exposed soils due to these activities have the potential to indirectly affect aquatic habitats and biota in the form of erosion and sedimentation to streams. Sediment is the primary pollutant of concern in forested watersheds in the Southeast. Fine sediment (<2 mm in diameter) is a natural part of streams in this region, however, an excess of stored sediment in stream substrate is detrimental to aquatic habitat. Excess fine sediment in stream systems fills interstitial space between larger rocks and reduces the amount of available fish and macroinvertebrate habitat (Wood and Armitage 1997). Sedimentation can result from ground-disturbing activities that expose mineral soil.

Effects to water resources as a result of forest management activities are mostly related to the construction of log landings, temporary roads, and road maintenance and/or reconstruction because they expose bare soil and increases susceptibility to erosion. Erosion hazard from these activities increases as slope increases. There will be no timber harvesting activities on slopes > 35%. Use of old roadbeds and landings for timber harvest activities, when they comply with Forest Plan standards and BMPs, would reduce the need for new soil disturbance and minimize soil disturbance and erosion. These features would receive maintenance or treatment as needed for use during the project. Decommissioned or non-system roads used for skid trails or other uses will also receive site-specific evaluation before any use. These features may also be treated before use (i.e. gravel surfacing), if necessary. Skid trails have less potential indirect effect on streams than temporary roads, because most of them are not excavated or highly compacted, and are covered with logging slash after their use is discontinued. Approximately 16 log landings (totaling about 4 acres), 44 acres of skid trails, and 2.8 miles of temporary roads would be constructed and utilized within the project area. The short duration of use until they are re-vegetated, small size, and wide distribution of these areas would mitigate their overall effect in the project area, and the implementation of riparian corridor standards (MRx 11) and Georgia BMPs for Forestry would ensure that water quality and aquatic habitat conditions would be maintained. These include direction as related to the proper placement of temporary roads and skid trails, the prompt re-vegetation of disturbed areas, restrictions related to skidding on steep slopes (>35%) and in riparian areas, the maintenance of shade to maintain water temperatures, and others. As a result, indirect impacts to aquatic habitat and aquatic species would be minimized. The application of Forest Plan standards for riparian corridors (management prescription 11) and Georgia BMPs for Forestry are effective in protecting water quality and aquatic biota from the effects of forest management actions (USDA Forest Service 2004b p. 3-244, Georgia Forestry Commission 2012, Cristan et al. 2015).

Old-growth designation would not affect aquatic habitats or riparian areas. There is an abundance of late-successional habitat in the project area, and designation of a small portion of it (5% of each subwatershed) for conservation as old-growth would not directly or indirectly affect water quality.

The changes in road management on FSR 792 and FSR 796 would have a positive effect on water quality and aquatic habitats. The seasonal closure of FSR 796 (McClure Creek) and the last mile of FSR 792 (Williamson Cove Road), the seeding of the road with a preferred seed mixture, and the "daylighting" of the road surface by mechanical means would likely reduce sedimentation to streams crossed by these roads. The reduction in management level

on FSR 797 from ML 3 to ML 2 would potentially result in less frequent road maintenance, which may cause some erosion and sedimentation increases. However, in reality, there is very little difference in ML 2 and ML 3 roads.

Effects of Alternative 3 (Partial Canopy Reduction): Effects to water quality and aquatic habitats due to the implementation of this Alternative would be minor due to compliance with Riparian Corridor standards and state BMPs. Slightly less acreage would be harvested, but slightly more miles of temporary roads and log landings would be necessary as compared to Alternative 2. Otherwise, this Alternative's effects would be similar to that described in Effects from Alternative 2. Either Alternative would maintain good water quality and healthy aquatic habitats.

Cumulative Effects: Riparian corridors within the Fightingtown Creek project area are almost completely forested with mid-late successional forest. Past, present, and reasonably foreseeable future actions in the project area are displayed in Table 10. Activities with the potential to affect or have affected aquatic habitats in the past 10 years are limited to ongoing system road maintenance, consisting of road grading, the periodic addition of gravel, and cleaning out ditches and culverts, which can result in localized sedimentation when near stream crossings. As a result of site-specific analysis, planning, and implementation of these other actions, aquatic habitats and associated biotic communities are intact and healthy, with no impairments to important functions or designated uses.

Effects to Climate

Current Conditions: Atmospheric levels of greenhouse gases (GHG), including carbon dioxide (CO_2) have increased over the last century due to increased burning of fossil fuels and land-use conversions (Ryan et al. 2010). Elevated levels of CO_2 in the atmosphere have increased global surface temperatures and are expected to alter climatic patterns in the future. In the southeast, climate change models indicate significant increases in air temperatures from historic and current levels. Precipitation patterns are predicted to be relatively stable, averaging slightly less to slightly above current conditions (TACCIMO 2012). Although the magnitude and temporal and spatial distribution of climate change are uncertain, all indications suggest that some change is certain.

Predicted changes in regional climate could affect forest productivity (both positively and negatively) and intensify disturbance events, including weather disturbances (droughts, storm intensities), insect and disease outbreaks, and wildfires. Forest management actions that condition forest communities for climate change by improving their resilience and resistance to climate-driven disturbances and that emphasize structural and age-class diversity have been recommended as strategies for adapting to predicted climate change patterns (Joyce et al. 2009).

Effects of Alternative A (No Action)

Direct and Indirect Effects – In general, no changes to current trends in carbon storage and release in the analysis area would occur. Current forest conditions would be unchanged and

less resilient to climate change impacts, including more severe disturbances (drought, insect and disease outbreaks, and wildfires).

Cumulative Effects – Because no activities are proposed under this alternative, there would be no effects that could be combined with past, present, or reasonably foreseeable future actions that could cause adverse cumulative effects to climate change or its impacts on vegetation in the analysis area.

Effects of Alternatives 2 and 3: The effects of treatments proposed under the action alternatives on altering the impacts of climate change on the forest communities in the analysis area are uncertain; however, proposed management actions are compatible with adaptation strategies recommended for responding to potential impacts associated with climate change.

The forest community in the Fightingtown Creek project area is dominated by late-successional forest. Even-aged regeneration treatments would create young, vigorous stands more resilient to disturbances associated with climate change and improve age-class and structural diversity within the forest community.

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and forest soils can offset concentrations of CO_2 emitted into the atmosphere. Additionally, forest and wood products contribute to carbon storage. In the U.S., forests and forest products have sequestered the equivalent of 10 to 19 percent of the nation's CO_2 emissions from burning fossil fuels during the last decade (Birdsey et al. 2006, Ryan et al. 2010, U.S. EPA 2012).

The proposed action and other action alternatives include timber harvesting to meet multiple resource objectives. These actions would temporarily reduce carbon storage in the analysis area. However, forest land-use and forestry practices continue to be a net carbon "sink," with carbon storage gains exceeding carbon losses (U.S. EPA 2012).

In stands proposed for regeneration harvest, most trees would be removed, temporarily decreasing carbon storage on these sites. Increased dead plant material (slash) resulting from the harvest would release carbon as this material decomposes, temporarily converting these areas to a "source" of carbon emission. Carbon storage losses would be somewhat offset by the amount of carbon stored in wood products removed from the site. The regenerated sites would recover carbon lost from removals and decomposition if the recovery period is long enough (Ryan et al. 2010). Time periods for recovery would depend on the rate at which vegetation re-establishes, growth rates of the vegetation, and frequency/severity of future disturbances. Predicted increases in disturbances related to climate change could interrupt recovery periods. Maintaining healthy forests by improving age-class structure could minimize impacts of climate change-driven disturbances predicted in the future.

The impacts of Alternatives 2 and 3 on global carbon sequestration and atmospheric concentrations of CO_2 are miniscule. Forest and forest products currently serve as a major carbon sink, offsetting 10 percent or more of the nation's CO_2 emissions. Predicted changes

in climate patterns and associated increases in frequency and intensity of disturbances have the potential to reduce the carbon sequestration capacity of our forests. Forests that are more resilient to climate change impacts could help sustain carbon storage potential. Proposed activities included in the action alternatives would make the forest more resilient and resistant to predicted climate change impacts.

Cumulative Effects – Action alternatives include timber harvesting to improve structural and age-class diversity. These actions would also reduce existing carbon stocks in the analysis area, but could improve resilience and resistance characteristics in response to predicted climate change patterns/disturbances. These effects represent the trade-offs associated with mitigation strategies designed to increase carbon storage and adaptation strategies designed to condition forests for changing environmental conditions (D'Amato 2011).

There are no past, present, or reasonably foreseeable activities potentially affecting climate which may be combined with those of the action alternatives.

Wildlife Habitat _____

Effects to Demand Species - Ruffed Grouse

Current conditions: Ruffed grouse reach the southernmost extent of their breeding range in the mountains of north Georgia (Schneider et al. 2010). They are uncommonly found in the Blue Ridge Mountains of Georgia, typically above elevations of 1800 feet. Although grouse populations in the southern Appalachians have historically occurred at lower densities than those in aspen-dominated landscapes, grouse numbers in the southern Appalachians have been declining for several decades as a result of a decrease in young forest cover (Dessecker and McCauley 2001). Hunting pressure in Georgia is low due to limited grouse distribution, low grouse numbers, and the type of rough cover and terrain that grouse inhabit (Georgia DNR 2016). Hunting mortality is not considered a major factor influencing population decline in Georgia.

Across their range, ruffed grouse prefer ESH, specifically early-successional deciduous forest habitats with high stem densities and dense herbaceous cover (Devers et al 2007). This type of habitat is valuable for nesting, drumming, and escape cover, which protects both chicks and adult grouse from their primary predators: raptors. It also provides protection from the elements and an abundant food source (buds, fruit, leaves, seeds). Survival is higher for grouse with home ranges containing more ESH (Clark 2000). This type of habitat is extremely rare on the Chattahoochee National Forest due to the lack of widespread even-aged timber harvest over the last few decades. The gradual aging of the Forest has led to serious declines in ruffed grouse populations. This has been documented in Georgia and other southern Appalachian states by data collected during breeding bird surveys (Schneider et al. 2010), drumming surveys, and grouse hunter harvest surveys (Georgia DNR unpublished information).

The Fightingtown Creek project area's current mix of successional stages is detailed in the section of this document titled Successional Stage Habitats. Timber harvest prior to National Forest ownership, then a series of timber cuts since the 1970s provided a well-distributed mosaic of ESH which formerly supported a healthy ruffed grouse population. Most timber cuts are optimal for grouse from 6 to 20 years after regeneration (Jones and Harper 2004). The youngest patches of forest in the project area have gradually become less suitable as grouse habitat as stem densities have decreased and canopies have closed. Drumming surveys conducted on FSR 792 (Williamson Cove) failed to detect any drumming males in the past 5 years.

Management recommendations for Appalachian grouse emphasize the need for young forest cover in close proximity to mature stands (Tirpak et al. 2010). Even-aged management techniques have been recommended as the best silvicultural methods for improving grouse habitat (Jones and Harper 2004). Mixed mesophytic forests (cove hardwoods) are recommended for treatment to provide quality cover and food. Habitat of this type should be distributed across the landscape and available within a grouse's small home range (25-30 acres) (Whittaker et al 2004). The juxtaposition of these cuts near mature oak stands is important to provide foraging opportunities for acorns without unnecessary travel and exposure to predators. Gated and seeded roads (with forbs, not perennial cool season grasses) are also recommended in association with timber harvest in order to provide travel corridors between habitat patches and brood-rearing habitat with abundant forbs and insects (Jones and Harper 2004, Jones et al 2008).

Effects of Alternative 1 (No Action Alternative): The proposed action would not be implemented. Current conditions would continue. Local ruffed grouse populations would continue to decline and face possible extirpation as the forest continues to age.

Effects of Alternative 2 (Proposed Action): Even-aged timber harvest proposed on 434 acres (17 stands) within the Fightingtown Creek project area would positively affect ruffed grouse populations by increasing available ESH. As described in the Proposed Action section on page 7, 15 of the 17 stands proposed for cutting are cove hardwood types. These stands were specifically selected as preferred forest types for ruffed grouse quality habitat management. The majority of trees in each stand would be harvested to maximize regeneration. The retention of 15 sq. ft./acre of residual basal area (canopy trees) within each cut would not inhibit dense stem densities (Dessecker et al. 2006); oaks and other mast-bearers would be favored as retention trees.

Ruffed grouse would likely avoid the cuts for the first year, increase in use for several years, and then preferentially use them for the next 6-20 years. The distribution of the proposed cuts within the landscape is conducive to use by ruffed grouse. Temporary roads and skid trails would be closed to vehicles and seeded with a preferred seed mixture following use. The resultant dense herbaceous vegetation and high arthropod density would result in high quality grouse brood habitat (Hollifield and Dimmick 1995, Haulton et al 2003).

Old-growth designation would not affect ruffed grouse. There is an abundance of late-successional habitat in the project area, and designation of a small portion of it (5% of each subwatershed) for conservation as old-growth would not directly or indirectly affect grouse.

The changes in road management on FSR 792 and FSR 796 would have a positive effect on ruffed grouse. The seasonal closure of FSR 796 (McClure Creek) and the last mile of FSR 792 (Williamson Cove Road), the seeding of the road with a preferred seed mixture, and the "daylighting" of the road surface by mechanical means would provide quality habitat for adult grouse and chicks. These areas would be maintained by annual mowing, periodic replanting, and periodic roadside vegetation maintenance. These road segments would be open to vehicles during April-September, otherwise they would be closed for walk-in hunting access. A new gate would be placed on FSR 792 approximately one mile from the end of the road, at a location that allows vehicles to turn around.

Effects of Alternative 3 (Partial Canopy Retention): This alternative proposes 394 acres of even-aged timber harvest. This is comprised of 16 stands of timber, 13 of which are also proposed for treatment in Alternative 2. This alternative would positively affect the ruffed grouse population in the Fightingtown Creek project area.

The full description of Alternative 3 is on pages 9-13 of this document. The three treatment types would result in even-aged stands, but more residual trees would be left on the majority of the acreage. This would result in fewer acres of regeneration (ESH) and more acres of mature trees within the stands.

- On 198 acres (7 stands), partial canopy retention of approximately 25% of each stand would result in ½ to 1 acre islands of retained trees within a matrix of regeneration. This arrangement would create beneficial ESH patches that are large enough and wide enough to avoid becoming a "predator trap" (Dr. Linda Ordiway, Ruffed Grouse Society, personal communication).
- On 91 acres (3 stands), a modified shelterwood treatment, 25-40 sq.ft/acre of overstory trees would be retained. Oaks and other mast-bearers would be favored as retention trees. This amount of retention would affect the regeneration somewhat, but it should still be sufficient to provide quality grouse habitat.
- On the remaining 105 acres (6 stands), the minimum required basal area (15 sq, feet/acre) would be retained. This treatment maximizes the creation of high stem densities.

Other actions proposed within this Alternative are identical to Alternative 2 (old growth designation and road use management.

Cumulative effects: There would be no cumulative effects from the No Action alternative.

There are no other actions in the project area that are likely to affect ruffed grouse populations when combined with the action alternatives.

Effects to Interior Birds

Current Conditions: The Appalachian Mountains contain some of the largest contiguous forest remaining in the eastern U.S. Many of the forests currently present in the Appalachian region developed after mass deforestation occurred in the late 19th and early 20th century. Though they exist in large tracts with dense, closed canopies, present-day forests are very

different from those existing prior to deforestation; they are uniform and lack the complexity of overstory and understory habitat structure required by many forest songbirds (Wood et al. 2013). As a result, despite the abundance of mature contiguous forest, many forest interior bird populations are declining (Hunter et al. 1999).

The majority of forest interior birds are neotropical migrants that primarily nest and raise young in the temperate Americas. This group includes birds like the hooded warbler (*Setophaga citrina*), wood thrush *(Hylocichla mustelina),* ovenbird *(Seiurus aurocapillus),* Kentucky warbler *(Oporornis formosus),* cerulean warbler *(Setophaga cerulea),* worm-eating warbler *(Helmitheros vermivorum),* and yellow-throated vireo *(Dendroica dominica).* Forest interior birds avoid forest edges during nesting and can be sensitive to forest fragmentation. Landscapes with at least 70-80% forest cover provide suitable habitat for forest interior species, because the relative amounts of forest edge is reduced (Robinson et al. 1995). Levels of nest parasitism and predation have been negatively correlated to the amount of forest cover in the landscape (Robinson et al. 1995).

The Fightingtown Creek project area lies within a large block of contiguous forested habitat totaling over 110,000 acres. Much of this is comprised of mature, closed-canopy forest without complex layers of deciduous vegetation, which develop over time as natural succession takes place. Although lacking this structural diversity, this area can be considered suitable habitat for forest interior birds.

The Fightingtown Creek project area is over 98% forested, and forest fragmentation is not a concern in the project area. Small openings such as road corridors are present, but these small openings do not fragment forest interiors when they are within a mostly forested landscape. Donovan et al. (1997) found that the negative impacts of edge effect (including increased nest parasitism and predation) was significantly greater in highly fragmented (less than 15% forested) landscapes than in moderately fragmented (45-55% forested) or unfragmented (more than 90% forested) landscapes in the mid-West.

The revised Forest Plan identified the ovenbird as a MIS to help indicate the effects of management on species associated with interior forest habitats on the Chattahoochee National Forest. Ovenbirds are strongly associated with mature forest interior habitats (Hamel 1992, Crawford et al. 1981). They generally breed in mature deciduous or mixed forests with limited understory and 60-90% canopy closure (Schneider et al. 2010). The availability of older hardwood stands on the Forest has increased over the last few decades. The ovenbird is a fairly common breeding bird on the Conasauga Ranger District and has been reported regularly from all of the breeding bird survey points in the project area (R8 Bird data).

Effects of Alternative 1 (No Action): This alternative would perpetuate current conditions and no direct or indirect impacts to interior forest habitat are expected.

Cumulative Effects: Because no activities are proposed under this alternative, there would be no effects that could be combined with past, present, or reasonably foreseeable future actions that could cause cumulative effects to forest interior birds or their habitats in the project area.

Effects of Alternatives 2: This alternative would affect forest interior habitats in the Fightingtown Creek project area by the regeneration harvest planned on 436 acres (17 stands). The regeneration of these stands would result in small openings in the forest canopy, affecting 3.7 percent of the overall project area. Preferred habitat and populations of interior forest species such as the ovenbird may be affected temporarily, prompting relocation to undisturbed areas, but when viewed from a landscape perspective this alternative would have positive effects. The small amounts of ESH created as a result of this alternative would provide valuable habitat for fledgling birds such as ovenbird. Patches of ESH are likely to have positive effects on juvenile birds, even those associated with forest interior habitat (Anders et al 1998). Clearcuts in a mostly forested (88%) West Virginia (Monongahela National Forest) landscape did not result in negative population effects such as those observed in areas fragmented by agricultural lands in the mid-West (Duguay et al. 2001).

Roadside vegetation maintenance would have a minor effect on forest interior birds and habitats because road corridors are already present, and increases in corridor widths would be negligible from a landscape perspective.

This alternative does not include treatments specifically designed to improve the structural complexity of mesic hardwood stands.

Effects of Alternative 3: This alternative would also positively affect forest interior birds and their habitats to a minor degree, with slightly fewer acres of mature forest being affected (16 stands, 394 acres vs. 436 acres). As described above, forest interior birds such as ovenbird may prefer mature forests, but patches of ESH are utilized during parts of their life cycle.

The majority of the stands are planned for treatment by the modified shelterwood and partial canopy retention methods. These methods would enhance breeding habitat conditions for forest interior birds by opening the closed canopy and allowing for the development of multiple layers of vegetation, and maintaining a higher percentage of residual canopy trees than in Alternative 2. The response of some species may be delayed until dense shrub cover develops (2-4 years) (Wood et al. 2013).

Cumulative Effects: Forest interior birds such as ovenbird and their habitats are abundant on the Forest. The availability of interior forest conditions on the Forest is expected to increase through the implementation of the revised Forest Plan (USDA Forest Service 2004a)**.** Bird survey data suggests that ovenbird populations have been relatively stable or slightly increasing on the Forest during the last decade (USDA Forest Service 2006). There are no past, present, or reasonably foreseeable future activities planned for the Fightingtown Creek project area that would combine with this proposal to affect the availability of interior forest habitat (primarily mature hardwood forests). Therefore no cumulative effects to interior forest habitat and associated species such as ovenbird are expected.

Effects to Threatened, Endangered, Sensitive, or Locally Rare (TES/LR) Terrestrial Wildlife

Current conditions: The Fightingtown Creek project area does not contain known populations or critical habitats for TES/LR wildlife species, including rare tree-roosting bats, but because the current range of these species on the Chattahoochee National Forest is unknown, the potential for their occurrence must be considered There has been no acoustic data collection or mist-netting for bats in the project area. The species analyzed in the Biological Assessment/Evaluation are summarized below:

Myotis septentrionalis (northern long-eared bat or NLEB) was formerly widespread across its range, including the forests of north Georgia, but its numbers have been reduced range-wide due to heavy losses from white-nose syndrome. NLEBs utilize cracks and crevices in live trees of all species and sizes for summer roosts/maternity habitat. They are known to utilize a network of roost trees and switch between them every few days (Silvis et al. 2014). This species could potentially be present in the Fightingtown Creek project area.

Due to the species' severe population decline, it was federally listed as threatened with an interim species-specific 4(d) rule in 2015. The interim 4(d) rule was replaced with a final 4(d) rule on January 14, 2016. This rule adopted the take prohibitions at 50 CFR §17.31 and §17.32 for this species, except for specifically defined activities. Take resulting from these activities is exempt from the take prohibitions provided that the activities:

- occur more than 0.25 mile (0.4 kilometer) from a known hibernacula;
- occur within 150 feet of known, occupied maternity roost trees during the pup season (June 1-July 31).

As a federal agency, the Forest Service must consult with the US Fish and Wildlife Service (USFWS) if its actions may affect a federally listed species, regardless of a 4(d) rule. For this reason, prior to federal listing of the NLEB, the Forest Service, Region 8, submitted a Biological Assessment (BA) for Activities Affecting NLEB on Southern National Forests to the USFWS (USDA Forest Service 2014). The BA was in support of the Forest Service's determination that the implementation of the various Forest Plans by National Forests in Region 8 may adversely affect the NLEB. However, although various forest management activities may incidentally take NLEB, the Forest Service is perpetuating forested habitat in the action area, and asserts that existing standards, guidelines, and best management practices in Forest Plans are likely to improve roosting and foraging habitat and minimize the incidental take of the species. The BA provided a description of activities implemented under Forest Plans that may affect the NLEB, including the maximum annual acreage anticipated for these activities on each Forest that would achieve the objectives of the Plans consistent with their standards and guidelines. The Forest Service, Region 8, has now received a programmatic Biological Opinion (BO) from the USFWS (USFWS 2015). This BO addresses the effects to NLEB resulting from continued implementation of Forest Plans and their associated projects on 15 National Forests and 1 National Recreation Area in the Southern Region. This includes timber harvest and associated temporary road construction or reconstruction, prescribed burning, trail construction, and non-timber clearing. The BO concluded that the implementation of the Forest Plans is likely to adversely affect NLEB, but is not likely to jeopardize the continued existence of the species.

Project-level activities (such as the actions proposed in the Fightingtown Creek project area) that are implemented consistent with the actions in the BA are exempt from further consultation with the USFWS provided they are consistent with the conservation measures of the final 4(d) rule, summarized above. None of the actions proposed in this project are within 0.25 mile of known, occupied hibernacula or maternity roost trees.

Myotis sodalis (Indiana bat) is an endangered bat which utilizes caves as winter hibernacula. This species has been severely affected by white-nose syndrome.
There are currently 281 hibernacula known in 19 states (USFWS 2009), none known in Georgia. In mid to late March, Indiana bats emerge from their winter caves and migrate northward or southward to wooded areas and roost in snags or live trees during the day. This species typically utilizes the largest available snags or trees with exfoliating bark or cavities with at least some exposure to sunlight as summer roosts/maternity habitat. Yellow pine snags in an open canopy on south and west aspects are preferred roost trees (Hammond et al 2016). The forests of north Georgia represent the southern edge of the summer range of Indiana bats, and population densities are likely to be extremely low.

Myotis leibii (eastern small-footed bat) is listed as Sensitive by the Forest Service and S2 (imperiled) by the state of Georgia. The species was recently proposed for federal listing, but listing was not found to be warranted. It roosts in cracks and crevices in trees, rocky outcrops, bridges, and other structures during the summer months. It has been found in several counties in mountainous north Georgia and though unlikely, there is a possibility that this species could be found in the project area (Trina Morris, GA DNR biologist, pers. comm.).

Corynorhinus rafinesquii (Rafinesque's big-eared bat) is listed as Sensitive by the Forest Service and as Rare by the state of Georgia. Males use large, hollow trees for roosting during the summer. The species' range is largely unknown in north Georgia, but its presence in the Fightingtown Creek project area cannot be ruled out (Trina Morris, GA DNR biologist, pers. comm.).

Effects of Alternative 1 (No Action Alternative): The proposed action would not be implemented. Current conditions would continue.

Effects of Alternatives 2 and 3:
Myotis septentrionalis (NLEB): The effects of Alternatives 2 and 3 on NLEB would be similar; Alternative 3 includes less acreage proposed for treatment, but neither Alternative proposes stands for treatment which contain specific habitats for NLEB or any other rare bats. Timber harvest in these alternatives may affect summer roosting NLEB if roost trees are cut down during use. This is unlikely due to the current rarity of this species on the Forest due to losses from white-nose syndrome, and this likelihood is low in areas of extensive, intact forest habitat, where a small percentage of the area may be affected by vegetation management activities. This likelihood is further mitigated by the retention of riparian buffers, snags, and some of the mature trees in each harvested stand. There are new forest-wide standards regarding the retention of trees in all even-aged management

treatments which will ensure sufficient trees and snags are present to mitigate the loss of roosting habitat. These are also listed in Table 8 on pages 13-15:

- No cutting of snags >6 inches DBH.
- In all silvicultural treatments, retention priority is given to the largest available trees with favorable characteristics as bat roost trees (yellow pines and oaks with crevices, cracks, or hollows).
- In even-aged regeneration, create 5 snags per acre if not present.
- In even-aged regeneration stands larger than 10 acres, maintain a minimum of 15 sq. feet of basal area. These can be arranged in clumps, corridors, or feathered edges.
- In stands over 10 acres treated as seed-tree or shelterwood with reserves, maintain a minimum of 20 sq. feet of basal area. Retain all trees within 20 feet of 5 snags per acre for windthrow protection and snag recruitment.
- All shagbark hickory trees would be retained.
- Protect known bat roosts from cutting or modification as long as suitable.

These standards would be beneficial to tree-roosting bats of all species. There are no other activities proposed in Alternatives 2 or 3 which may affect NLEBs. In summary, this project may adversely affect the NLEB due to the possible loss of occupied roost trees; however, there are no effects beyond those previously disclosed in the regional programmatic BO described above. Any taking that may occur incidental to this project is exempt from the prohibitions for taking threatened species under 50 CFR 17.31 and 17.32. This project is consistent with the Forest Plan, the description of the proposed action in the programmatic BO, and activities excepted from taking prohibitions under the ESA section 4(d) rule applicable to the NLEB; therefore, the programmatic BO satisfies the Forest Service's responsibilities under ESA section 7(a)(2) relative to the NLEB for this project.

Myotis sodalis (Indiana bat): This species is extremely rare in north Georgia. The Fightingtown Creek project area is approximately 15 miles from the only known maternity colony for this species in Georgia and there is a lack of preferred habitat in the project area. None of the stands proposed for treatment are typified by xeric yellow pine stands on south or west aspects. The likelihood that either Alternative proposed in this project may affect this species is discountable.

Myotis leibii (Eastern small-footed bat): There are no records of this species in Fannin or Gilmer County, Georgia, and no known hibernacula in or near the project area. Most records of this species are associated with caves, tunnels, buildings, bridges, or talus slopes; none of these habitats are known from the project area. It is unlikely that timber harvest in either Alternative would affect roosting small-footed bats due to their natural rarity and patchy occurrence. The retention of snags and potential roost trees in the proposed treatment and the creation of patches of ESH would ultimately benefit this species.

Corynorhinus rafinesquii (Rafinesque's big-eared bat): Neither of these alternatives are likely to affect this species: because of its natural rarity it is unlikely to occupy the project area. In addition, there is an abundance of older forest habitat on the forest where hollow trees are common. In addition, males are capable of relocating roost trees if disturbed by noise or activity. These alternatives would have little or no effect on this species.

Cumulative effects: There would be no cumulative effects from the No Action alternative.

There are no other past, present, or reasonably foreseeable future actions in the project area that are likely to affect these TES/LR terrestrial wildlife populations when combined with Alternatives 2 or 3.

Social Resources

Recreation and Access

This section discloses the effects of proposed project activities on Recreation and Access resources within the Fightingtown Creek project area.

Existing Conditions:

The Recreation Opportunity Spectrum (ROS) is a management tool designed to express combinations of recreational activities, resource settings, and probable experience opportunities along a continuum, and identify areas that can accommodate those experiences. Approximately 80% of the Fightingtown Creek project area occurs within the Roaded-Natural (RN) Recreation Opportunity Setting (ROS). In the Roaded Natural class, recreation can be either developed or dispersed, depending on the management prescription, with access provided primarily via conventional motorized use on roads. Contact frequency with other users may be low to moderate on trails and moderate to high on roads. The environment is natural appearing as viewed from visually sensitive roads and trails. Within the MRx 9.H, the dominant management prescription of the Fightingtown Creek project area, the recreation use emphasis is on dispersed activities such as hunting, fishing, or hiking, with localized and limited development facilitating those uses. Visitors should expect limited, rustic amenities and should be self-reliant and well prepared. Restoration of plant communities takes precedence over recreation in MRx 9.H., and recreation uses may be redirected or suspended in some locations due to restoration activities. Access may be possible by passenger car in good weather, but roads are not designed or maintained for them. Roads are well located, stable and suitable for use by the types of vehicles and during the use periods appropriate to the achievement of the emphasis for the area (hunting, fishing, hiking).

The remaining Fightingtown Creek project area (approx. 20%) occurs in the Semi-Primitive Non-Motorized (SPNM) ROS. The SPNM has a setting that has an area of primitive roads or trails that are not open to motorized use and are between ½ to 3 miles from all roads, railroads, or trails with motorized use. Access is via non-motorized trails or non-motorized primitive roads or cross-country. Recreation is dispersed. Forest users can expect low contact frequency with other visitors and have a high probability of experiencing solitude in a natural-appearing environment.

There are no developed recreation facilities within the Fightingtown Creek Analysis area. Some dispersed camping does occur, primarily associated with the hunting seasons. Hunting and fishing are the predominant recreational activities occurring.

Approximately 7 miles of the Benton MacKaye Trail follows the southwest boundary of the project area. This non-motor trail has a primary designation for hiking, and has been identified in the forest plan as a "primary trail." Primary trails are those trails having National recognition, or the potential to receive it. There are no other designated trails within the project area.

Cross-country horse travel is currently allowed within the project area and reported to occur with low to moderate frequency. There has been concern expressed about this cross country travel occurring near or in a sensitive plant location. Horse use around this area is monitored and management actions have been taken to protect the area from damage. Some mountain bike usage of the existing open roads is also occurring.

There are no designed motorized (OHV) trails within the project area. Illegal ATV access and usage of existing roadbeds has been an issue within the project area in the past. Efforts to restrict ATV access into the area in 2014 did reduce the amount of illegal usage, but some incursions still exist.

Effects of Alternative A (No Action)

Direct and Indirect Effects – Since no action would take place, there would be no direct or indirect effect to recreational uses in the project area.

Cumulative Effects – Because no activities are proposed under this alternative, there would be no effects that could be combined with past, present or reasonably foreseeable future actions that could cause cumulative effects to recreational uses in the Fightingtown project area.

Effects of Proposed Action (Alternative 2)

Direct and Indirect Effects –

Vegetation Management Activities: A total of 436 acres of vegetation management activities would be implemented under this alternative. Impacts to recreation would include:

- Restricted access to the area during active sale operations if deemed necessary for safety reasons. This may occur within various hunting seasons.
- Noise disturbances that may temporarily impact (decrease) opportunities for solitude.
- Forest visitors driving for pleasure may encounter temporary restrictions to access in conjunction with logging activities.
- Encounters with logging equipment and increased vehicle traffic on the developed forest roads within the project area.
- Some visual impacts will be evident as described in the Visuals section.
- Established dispersed camping sites could be closed down for safety reasons when near on-going timber harvest activities. Sites may be closed from one day up to four months.

- Positive benefits for hunters by improving wildlife habitat in the years following the treatments.

There will be no impacts to the Benton MacKaye Trail due to the fact that all treatment areas are at least two miles away from and on the other side of the ridgeline from the Benton MacKaye trail corridor.

Illegal ATV usage of temporary roads utilized for vegetation management activities will be mitigated through the design criteria/features described in Table 8.

Old-Growth Designation – Under the proposed action, 461 acres of forest will be designated as "Old Growth" and reserved from cutting.

- There will be no effects to any recreational resources from this designation.

Associated Road Activities – There are three categories of road activities under both the Proposed Action and Alternative 3

- Road Management: FSR 797 (Hickory Nut Road) would move from a (Maintenance Leve 3 (ML 3) to a Maintenance Level 2(ML 2), thereby reducing the frequency of maintenance. The last mile of Forest Service Road 792 (Williamson Cove Road) will be gated and use reduced from year round use to seasonal use, and FSR 796, McClure Creek Road will be reduced from year-round use to seasonal use. The gates on these seasonal road sections will be open from April through September. At other times of the year, these road sections will be walk-in only.
- Road Reconstruction activities including widening of roadbed surface in curves, removal of vegetation in roadbed surface, improvement of drainage structures, spot placement of gravel and erosion control. Roads included in these activities are FSR 792 (Williamson Cove); FSR 797 (Hickory Nut Gap); FSR 796 (McClure Creek); and FSR 798 Porter Mountain.
- Road Maintenance activities including surface blading, brushing of roadside vegetation, spot placement of gravel, maintenance or improvement of drainage structures and erosion control. Roads included in these activities are FSR 792 (Williamson Cove); FSR 797 (Hickory Nut Gap); FSR 796 (McClure Creek); and FSR 798 Porter Mountain.

Impacts from associated road activities on recreation would include:

- Potential decrease in overall road conditions on FSR 797 (Hickory Nut Road) over time with the decrease in frequency of maintenance.
- Decrease in overall vehicle access to FSR 792 (Williamson Cove Road) and FSR 796 (McClure Creek Road) due to the implementation of seasonal gate closures.
- Increase in opportunity for more primitive (walk-in) recreation due to the seasonal gate closures.
- Initial improvement of road conditions after implementation of road reconstruction and maintenance activities.

Effects of Alternative 3 (Partial Canopy Retention: This Alternative would be identical to Alternative 2 regarding the effects to recreation.

Cumulative Effects: The proposed action and Alternative 3 both have impacts on recreation in the form of more limited vehicle access. There is one past action that has also limited vehicle access in this area. In 2015, approximately 1 mile of FSR 796 (McClure Creek Road) was decommissioned. This combined with the proposed seasonal closure of the remaining portion of McClure Creek Road in this project would have a cumulative effect to motorized access of the areas serviced by the McClure Creek Road. There are no other present, or reasonably foreseeable future actions which might combine with these activities.

Visual and Scenery Resources

This section discloses the effects of proposed project activities on the Landscape Character and Scenic Integrity Objective (SIO) as determined in the Forest Plan using the Scenery Management System (SMS). The SMS uses scenic classes based on the relative value and importance of the landscape to the viewing public on a scale of one through seven. Scenic classes were derived by combining the scenic attractiveness of the area (which includes landscape character and existing scenic integrity) with landscape visibility (which includes concern levels, distance zones, and travel way importance). The Guidelines and Techniques to Achieve Scenic Integrity Objectives and Landscape Character in Southern Region National Forests (USDA Forest Service 2008) provide mitigation procedures for implementing vegetation management treatments (Appendix B).

Existing Conditions: The Fightingtown Creek analysis area is visible from a range of vantage points along nearby travel corridors and access roads. These include: foreground, and middle-ground views of the project area from Forest Road 792, Williamson Cove; foreground views from Forest Road 796, McClure Creek Road; foreground and middle-ground views from Forest Road 797, Hickory Nut Gap Road. Note that there are also foreground views from Forest Road 798, Porter Mountain Road, but this road is only open to administrative use. Also, brief glimpses of the higher elevation treatment areas may be seen from Cashes Valley Road, Old Georgia 2, and Devil's Den Road.

The Fightingtown Creek analysis area is divided among five mapped Management Prescriptions (MRx): MRx 4.D – Botanical-zoological areas (1%); MRx 7.B – Scenic Corridors and Sensitive Viewsheds (6%); MRx 8.E.3 – High-elevation, early-successional habitat (1%); MRx 9.H – Management, maintenance, and restoration of Plant Associations (73%); and MRx 12.A – Remote backcountry recreation (19%). All stands proposed for treatment fall within the MRx9.H . The management emphasis in MRx9.H is the restoration of historical plant associations and their ecological dynamics to ecologically appropriate locations. The landscape character is natural-appearing. Management changes are the primary agent of strong change in visual elements, but management changes are designed to be low to moderate in contrast and therefore compatible with the Scenic Integrity Objectives (SIOs).

Management activities in the MRx 9.H are designed to meet or exceed the following Scenic Integrity Objectives, which vary by the inventoried Scenic Class. Table 21 illustrates the relationship between the Scenic Class and Scenic Integrity Objectives for MRx 9.H. It also

shows the percentages and acres of the proposed stands as related to their inventoried scenic class and the resulting SIO.

Table 21. Scenic Integrity Objectives by inventoried Scenic Class in the MRx 9.H and their percentages in stands to be treated in the proposed action (Alternative 2) and in Alternative 3

Inventoried Scenic Class	1	2	3	4	5	6	7
Scenic Integrity Objectives MRx 9.H	H	M	L	L	L	L	L
Proposed Action – Alternative 2	0 ac	344 Acres (79%)	38 acres (9%)	54 acres (12%)	0	0	0
Alternative 3	0 ac	284 acres (72%)	56 acres (14%)	53 acres (14%)	0	0	0

H = High M=Medium L=Low

Scenic Integrity can be defined as a measure of the degree to which a landscape is visually perceived to be "complete". It is a continuum ranging over five levels of integrity, defined by the following:

- *Very High* refers to landscapes where the valued landscape character "is" intact with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest level;
- *High* refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat form, line, color, texture and pattern common to the landscape character so completely and at such scale that they are not evident;
- *Moderate* refers to landscapes where the valued landscape character "appears slightly altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed;
- *Low* refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes and architectural styles outside the landscape being viewed;
- *Very Low* refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or outside the landscape being viewed.

Scenic Integrity Objectives (SIOs) correspond to the levels of Scenic Integrity, by defining the desired Scenic Integrity condition (or objective) for an area: thus defining the level of maintenance or in some cases, restoration required to meet SIOs. In the Fightingtown Creek project area, current Scenic Integrity could be generally characterized as Moderate to Low, with landscape character appearing slightly or moderately altered. Vegetation management activities would thus need to be designed to preserve or improve SIOs according to the SIO of the area being treated.

Between 73 and 77% of the *proposed treatment areas* in both the Proposed Action, and Alternative 3, are classified as having moderate SIOs, with the remaining *proposed treatment areas* (37 to 33%) having SIOs of "low".

Effects of Alternative 1 (No Action) on Visual or Scenery Resources

Direct and Indirect Effects – No changes to the current visual character of the analysis area would occur due to management activities under this alternative. Gradual changes in visual elements would continue to occur as a result of natural processes.

Cumulative Effects – Because no activities are proposed under this alternative, there would be no effects that could be combined with past, present or reasonably foreseeable future actions that could cause adverse effects to the scenery resources in the Fightingtown Creek analysis area.

Effects of the Proposed Action (Alternative 2) on Visual or Scenery Resources

Direct and Indirect Effects – A total of 436 acres of vegetation management activities would be implemented under this alternative. Proposed activities have the potential to alter the current visual resources in the analysis area by changing stand structure and creating visible gaps in the vegetation, particularly in the areas seen as foreground and middle-ground. The following treatments would be implemented under the Proposed Action:
Even-Aged Regeneration Harvest - Approximately 436 acres in 17 stands are proposed for a combination of commercial and noncommercial timber harvest utilizing even-aged management, all within MRx9.H. The majority of overstory trees in these stands would be removed, and the stands would be allowed to naturally regenerate. These stands are dominated by mesic deciduous hardwoods or white pine (*Pinus strobus*) and would likely regenerate to the same species. A portion of the trees would be reserved from cutting. These trees would be retained in a non-uniform and variable distribution and would remain on site indefinitely. Long-lived species such as white oak (*Quercus alba*) would be selected as reserve trees to be retained. These treatments are often viewed as "clear-cuts", and visual impacts will likely be significant, particularly where these treatments occur directly adjacent to the forest roads, or can be seen as middle-ground from these roads. Forest Road 792 (Williamson Cove Road) has the largest number of these foreground and middle ground stands, and will thus have the most visual impacts. Significant gaps or open areas in vegetation will be evident for at least 10-15 years until the regenerative trees mature and begin to fill out. Long-distance or background views of these treatments will also be impacted as these gaps will be visible even at a long distance. Treatments located at higher

elevations close to ridgelines will be most evident in the distance views, such as from Old GA 2, Cashes Valley Road and Devil's Den Road, but these will be brief glimpses only. Those treatments occurring at lower elevations will mostly be hidden by the surrounding topography, unless they occur directly adjacent to developed roads.

The following design features would be utilized to minimize the visual effects (from Table 8 and Appendix B):

- Regeneration areas in or abutting deciduous or mixed forests must include a 50-foot zone along mature forest edges in which intensity of silvicultural treatment decreases, resulting in a transitional or feathered edge (FWS-007).
- Layout of regeneration areas would incorporate irregular-shaped boundary edges to minimize straight-edge effects and contrast between un-treated areas.
- Layout of regeneration areas would incorporate a no-harvest zone between unit boundaries and open Forest Roads/private property.
- Layout of regeneration areas by design would leave areas un-harvested along prominent ridge-lines and/or sites of higher elevation to reduce "sky-lighting" effects and to obscure areas of lower elevation in regeneration.

One block of private land containing a year-round residence lies adjacent to several proposed treatment stands (C682 stand 21, C683 stand 1, C684 stand 31). Although these stands' scenic integrity objectives are 'low', 'low', and 'moderate', respectively, visual impacts are likely due to the close proximity. The above design features and others found in Appendix B would be utilized to minimize the visual effects from this property.

Effects of Alternative 3 (Partial Canopy Retention):

Three Timber Harvest methods are applied in this alternative totaling 394 acres of treatment. Seven (7) stands totaling 198 acres would be treated utilizing the Two-Aged Regeneration – Partial Retention of Canopy method which would reserve 25 percent of the existing overstory from cutting within the boundary of harvest units. This would create islands of mature forest within a matrix of clearings. Three (3) stands totaling 91 acres would be treated utilizing the Two-Aged Regeneration-Shelterwood with Reserves method, which selects individual trees (with a preference for oaks) as leave trees left for retention. This method creates a non-uniform and variable pattern of vegetation, with some areas void of leave trees and other areas with clusters of leave trees. A third method, Even-Aged Regeneration Harvest, would be applied to six selected cove hardwood stands and stands dominated by white pine totaling 105 acres. Under this method, the majority of overstory trees would be harvested to create a new even-aged cohort of regeneration within the harvest units, with a minimum 15 ft^2 per acre reserved from cutting. This creates a more open, non-uniform pattern of understory and non-mature trees.

In all three of the methods utilized in this alternative, moderate visual effects will be evident, particularly along the forest roads 792, 796, 797, 798 where foreground and middle-ground views are dominant. When viewed in the middle-ground, these regeneration harvest areas may appear more sparsely vegetated than adjacent non-treated stands, however, openings will be less distinct than the regeneration openings favored in the Proposed Action. Higher

leave-tree densities will reduce the contrast between treated and un-treated adjacent areas, and the adoption of Forest wide standard FWS-007 (feathering of unit boundaries) reduces shadow-lines along unit edges. The ground beneath remaining overstory trees would be visible to varying degrees during the growing season, but visibility is often obscured within two to three years as the understory vegetation develops. During the dormant season (leaf-off) regeneration treatment areas are less distinguishable from untreated areas from middle ground views, but evidence of logging (slash, landings, skid trail and temporary roads) may be more noticeable. Canopy closure of the regenerating stands typically occurs within 10 years. Visual impacts (contrast) beyond this period are typically minor, particularly from middle ground and farther views.

This alterative includes treatment of three stands (C683 stands 1, 2, and 3) utilizing the partial canopy retention method and one stand to be treated by the even-aged regeneration treatment (C682 stand 21). These stands are directly adjacent to the private inholding noted in the discussion of effects under Alternative 2. The scenic integrity objective for these stands is "low" for all except C683 stand 3, which is "moderate". This alternative would be consistent with those scenic objectives.

The application of the following design features would be utilized to minimize the visual effects:

- Regeneration areas in or abutting deciduous or mixed forests must include a 50-foot zone along mature forest edges in which intensity of silvicultural treatment decreases, resulting in a transitional or feathered edge.
- Layout of regeneration areas would incorporate irregular-shaped boundary edges to minimize straight-edge effects and contrast between un-treated areas.
- Layout of regeneration areas would incorporate a no-harvest zone between unit boundaries and open Forest Roads and/or private property.
- Layout of regeneration areas by design would leave areas un-harvested along prominent ridge-lines and/or sites of higher elevation to reduce "sky-lighting" effects and to obscure areas of lower elevation in regeneration.

Cumulative Effects: The proposed action and Alternative 2 both have impacts on visual/scenery resources in the form of noticeable changes in the composition of stands and visible gaps in vegetation. However, there are no past, present or reasonably foreseeable future actions which might combine with activities associated with this project to create negative cumulative effects.

Economic Analysis_____

An analysis of the economic efficiency of the alternatives was conducted in order to provide a reliable means to contrast the relative costs and benefits of the proposed activities. The results provide the Responsible Official with assurance that economic efficiency was considered. It also provides some information about the potential economic impacts of each alternative.

This analysis considered the monetary benefits and costs to plan, analyze, prepare, implement and administer the silvicultural activities included in the Fightingtown Creek Early-Successional Habitat project. Benefits considered in the analysis include revenue generated by timber harvest actions. Costs considered in the analysis were divided into two broad categories and include: (1) Forest Service expenditures (costs) of appropriated funds to plan, analyze, prepare, and administer the project alternatives and (2) project activity costs (site preparation, timber stand improvement, road reconstruction, etc.) expected to be funded by timber harvest revenue or value. Non-silvicultural activities were not included in the analysis.

It should be noted that the proposed activities in the Fightingtown Creek Early-Successional Habitat project can produce both positive and negative changes to other resources, such as wildlife habitat, soils, recreational opportunities, public access, etc. These changes can have an associated economic value/impact, but they are difficult to measure, and therefore were not considered in the analysis.

Results of the economic analysis are shown in Table 20 below. The following assumptions were made for this analysis:

- Discount rate used – 4 percent;
- The analysis time-line begins with the environmental analysis process and continues through implementation of timber harvesting and connected activities in project area stands;
- Baseline costs and revenues for each activity are consistent across all alternatives for comparison purposes;
- Benefit values are based on current Forest transaction evidence appraisal data and cost values were derived from District service contract rates for silvicultural work from similar projects; and
- Only action alternatives have monetary benefits (revenue from timber harvest).

Table 22. Results of economic analysis by Alternative for the Fightingtown Creek Early-Successional Habitat Project

	Present Value-Costs			Present Value-Benefits			Benefit/Cost Ratio		
	Alternative			Alternative			Alternative		
	1	2	3	1	2	3	1	2	3
Project Activity Analysis									
RRF	0	-$61,301.56	-$56,271.69	0	$116,011.46	$91,223.19	N/A	1.89	1.62
RRF+STH	0	-99,725.41	-$88,205.54	0	$116,011.46	$91,223.19	N/A	1.16	1.03
Project Activity Analysis with Planning, Preparation and Administration Costs Included									
SP+HA	0	-$48,019.23	-$39,917.31	0	$116,011.46	$91,223.19	N/A	2.42	2.29
SP+HA+RRF	0	-$109,320.80	-$96,189.00	0	$116,011.46	$91,223.19	N/A	1.06	0.95
SP+HA+RRF+STH	0	-$147,744.64	-$128,122.85	0	$116,011.46	$91,223.19	N/A	0.79	0.71
PL+SP+HA+RRF+STH	-$27,240.00	-$174,984.64	-$150,766.85	0	$116,011.46	$91,223.19	0.00	0.66	0.61

RRF=Required Reforestation; STH=Short Truck Haul adjustment; SP=Sale Preparation; HA=Harvest Administration; PL=NEPA Planning and Analysis.

Alternative 1-No Action

Alternative 1 would not improve habitat diversity within the project area by creating early-successional forest habitat. Timber harvests and other associated project activities would not be implemented, thereby eliminating the economic benefits potentially derived from these activities.

Alternatives 2 and 3

The economic analysis indicates that both action alternatives have Benefit/Cost (B/C) ratios less than 1.0 (066 and 0.61 for Alternatives 2 and 3, respectively). The present value (PV) of benefits from the action alternatives (i.e. timber harvest revenue) are less than the total PV cost of the project when Forest Service costs to plan, analyze, prepare and administer are considered in addition to direct costs for project activities. PV of benefits from Alternative 2 are greater than the PV benefits derived from Alternative 3 because more acres of treatment are proposed under Alternative 2 and because of differences in timber harvest methods proposed between the two action alternatives.

The analysis does suggest that the proposed timber harvest revenue will support all proposed project activities included under each action alternative, including required reforestation and cost adjustments related to timber haul. The *project activity* analysis indicates that both action alternatives have B/C ratios greater than 1.0 (1.16 and 1.03 for Alternatives 2 and 3, respectively). Alternative 2 has a Net Present Value (NPV) of approximately $16,000 (not shown in Table 22), which is more than four times greater than the NPV for Alternative 3 (approximately $3,000 – also not shown in Table 22).

Both action alternatives would improve wildlife habitat diversity within the project area by creating from 394 (Alternative 3) to 436 (Alternative 2) acres of early-successional forest habitats. Implementation of the activities proposed by the action alternatives would produce a positive effect on the local economy. An estimated 4,500 CCF (2.25 MMBF) of timber would be offered for sale in the local market under Alternative 2. Alternative 3 would yield an estimated 3,800 CCF (1.9 MMBF). The timber harvest component of the project's action alternatives would provide jobs and income for local logging companies while producing indirect benefits to primary and secondary manufactures of wood products (supply of raw materials and employment opportunities). The total NP value of the timber released to the economy is estimated to be more than $116,000 under Alternative 2 and over $90,000 under Alternative 3. This alternative also includes connected service project work such as site preparation and timber stand improvement that would release nearly from $35,000 (Alternative 3) to nearly $55,000 (Alternative 2) into the local economy over the next decade to forestry contractors and the supporting local service industry.

CONSULTATION AND COORDINATION

Preparers

Ruth Stokes – USDA Forest Service, Conasauga Ranger District, Chattahoochee-Oconee National Forests, Georgia, Wildlife Biologist (2004 to present)

Education: B.S. Zoology, University of Tennessee; M.S. Wildlife and Fisheries Science, University of Tennessee

Experience: Forest Service – 6 years, Wildlife Biology, Cherokee National Forest, Tennessee; 12 years, Wildlife Biology, Chattahoochee-Oconee NFs, GA

Danny Skojac - USDA Forest Service, Conasauga Ranger District, Chattahoochee-Oconee National Forests, Georgia, Contracting Officer (2016 to present).

Education: B.S. Natural Resource Management, Western Carolina University; M.S. Forestry, Mississippi State University

Experience: Forest Service – 8 years, Forestry Technician, Southern Research Station, Stoneville, MS; 2 years - Forester, Ozark-St. Francis National Forest, Arkansas; 8 years - District Timber Management Officer/Silviculturist, Chattahoochee-Oconee NFs, Georgia; 1 month - Contracting Officer, Chattahoochee-Oconee NFs, GA.

Karen Larsen – USDA Forest Service, Conasauga Ranger District, Chattahoochee-Oconee National Forests, Georgia, District Recreation Program Manager (2012 to present)

Education: B.A. Biology, Albion College (MI)

Experience: 10 years, Wildlife/Trails Technician, Shenandoah National Park, VA; Voyageurs National Park, MN; 8 years, Recreation Technician, Chequamegon-Nicolet National Forests, WI; Olympic National Forest, WA; 4 years, Recreation Program Manager, Chattahoochee-Oconee NFs, GA

FEDERAL, STATE, AND LOCAL AGENCIES*:*

Georgia State Historic Preservation Office

Georgia Department of Natural Resources

TRIBES:

Lisa LaRue-Baker, Acting THPO, United Keetoowah Band of Cherokee Indians in Oklahoma

OTHERS*:*

Georgia ForestWatch
The Ruffed Grouse Society
Georgia Department of Natural Resources, Wildlife Resources Division

Literature Cited

Anders, A.D.; Faaborg, F.; Thompson, R. 1998. Postfledging dispersal, habitat use, and home-ranges size of juvenile wood thrushes. Auk 115, 349-358.

Birdsey, Richard; Pregitzer, Kurt; and Lucier, Alan. 2006. Forest carbon management in the United States: 1600-2100. Journal of Environmental Quality 35, 1461-1469.

Clark, M.E. 2000. Survival, fall movements, and habitat use of hunted and non-hunted grouse in northern Michigan. Dissertation, Michigan State University, Lansing, MI, USA.

Clinton, B.D. 2011. Stream water responses to timber harvest: riparian buffer width effectiveness. Forest Ecology and Management 261:979-988.

Crawford, H. S., R. G. Hooper, and R. W. Tittterington. 1981. Songbird population response to silvicultural practices in central Appalachian hardwoods. J. Wildl. Manage. 45, 680-692.

Cristan, R., W.M. Aust, M.C. Bolding, S. M. Barrett, J.F. Munsell, and E. Schilling. 2015. Effectiveness of forestry best management practices in the United States: literature review. Forest Ecology and Management 360:133-151.

D'Amato, Anthony W.; Bradford, John B.; Fraver, Shawn; and Palik, Brian J. 2011. Forest management for mitigation and adaptation to climate change: insights from long-term silvicultural experiments. Forest Ecology and Management 262, 803-816.

Dessecker, Daniel R. and McAuley, Daniel G. 2001. Importance of early successional habitat for forest game birds. Wildlife Society Bulletin 29:456-465.

Dessecker, D. R., G.W. Norman, S. J. Williamson, editors. 2006. Ruffed grouse conservation plan. Association of Fish and Wildlife Agencies, Resident Game Bird Working Group.

Devers, P.K, D.F. Stauffer, G.W. Norman, D.E. Steffen, D.M. Whitaker, J.D. Sole, T.J. Allen, S.I. Bittner, D.A. Buehler, J. W. Edwards, D.E. Figert, S.T. Friedhoff, W.M. Guiliano, C.A. Harper, W.K Igo, R.L. Kirkpatrick, M.H. Seamster, H.A. Spiker, D.A. Swanson, B.C. Tefft. 2007. Ruffed grouse population ecology in the Appalachian region. Wildl. Monogr., 168.

Donovan, T., P. Jones, E. Annand, and F. Thompson. 1997. Variation in local scale edge effects: mechanisms and landscape context. Ecology 78(7), 2064-2075.

DuGuay, J., P. Wood, and J. Nichols. 2001. Songbird abundance and avian nest survival rates in forests fragmented by different silvicultural techniques. Cons. Biol.15 (5), 1405-1415.

Gardiner, Emile S. and Hodges, John D. 1998. Growth and biomass distribution of cherrybark oak (*Quercus pagoda* Raf.) seedlings as influenced by light availability. Forest ecology and Management 108, 127-134.

Georgia Department of Natural Resources. 2005. Georgia Rules and Regulations for Water Quality Control: Chapter 391-3-6. Georgia Department of Natural Resources - Environmental Protection Division, Atlanta, GA

Georgia Forestry Commission. 2009. Georgia's Best Management Practices for Forestry. Georgia Forestry Commission, Macon, GA 72 pp.

Georgia Forestry Commission. 2012. Results of Georgia's 2011 silvicultural best management practices implementation and compliance survey. Georgia Forestry Commission, Macon, GA. 46 pp.

Gucinski, Hermann, M.J Furniss, R.R. Ziemer, and M.H. Brookes. 2000. Forest roads: A synthesis of scientific information. United States Department of Agriculture Forest Service. 117 pp.

Hamel, P. B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern region, Chapel Hill, NC. 437pp.

Hammond, K.R., J.M. O'Keefe, S.P. Aldrich, and S.C. Loeb. 2016. A presence-only model of suitable roosting habitat for the endangered Indiana bat in the Southern Appalachians. PLoS ONE 11(4):e0154464.

Haulton, G.S., D. F. Stauffer, and R.L. Kirkpatrick. 2003. Ruffed grouse (*Bonasa umbellus*) brood microhabitat selection in the southern Appalachians. Am. Midl. Nat. 150:95-103.

Hollifield, B.K. and R.W. Dimmick. 1995. Arthropod abundance relative to forest management practices benefiting ruffed grouse in the southern Appalachians. Wildlife Society Bulletin 1995, 23(4):756-764.

Hunter, C., R. Katz, D. Pashley, and B. Ford. 1999. Partners in Flight bird conservation plan for the Southern Blue Ridge (Physiographic Area 23), Version 1.0. American Bird Conservancy. The Plains, Virginia. 85 pp.

Hunter, W. C., D. A. Buehler, R. A. Canterbury, J. L. Confer, and P. B. Hamel. 2001. Conservation of disturbance-dependent birds in eastern North America. Wildl. Soc. Bull. 29 (2):440-455.

Jensen, John B., Carlos D. Camp, Whit Gibbons, and Matt J. Elliot, editors. 2008. Amphibians and Reptiles of Georgia. University of Georgia Press, Athens, GA. 575 pp.

Jones, B.C. and C.A Harper. 2004. Management recommendations in: Ruffed Grouse Ecology and Management in the Appalachian Region. Final Report of the Appalachian Cooperative Grouse Research Project. 61 pp.

Jones, B.C., J.L. Kleitch, C.A. Harper, and D.A. Buehler. 2008. Ruffed grouse brood habitat use in a mixed hardwood forest: Implications for forest management in the Appalachians. Forest Ecology and Management 255 (2008) 3580-3588.

Joyce, Linda A.; Blate, Geoffrey M.; McNulty, Steven G.; Millar, Constance I.; Moser, Susanne; Neilson, Ronald P.; and Peterson, David L. 2009. Managing for multiple resources under climate change: National Forest. Environmental Management 44, 1022-1032.

Knoepp, Jennifer D. and W.T. Swank. 1997. Long-term effects of commercial sawlog harvest on soil cation concentrations. Forest Ecology and Management 93, 1-7.

Loftis David L. 1990. A shelterwood method for regenerating red oak in the southern Appalachians. Forest Science 36(4), 917-929.

Loftis, David L. and McGee, Charles E. (eds). 1993. Oak regeneration: Serious problems, practical recommendations. Symposium proceedings, September 8-10, 1992, Knoxville, TN. Gen. Tech. Rep. SE-84, USDA Forest Service, Southeastern Forest Experiment Station, Asheville, NC 319 pp.

Longing, S. D., J. R. Voshell, Jr., C. A. Dolloff, C. N. Roghair. 2010. Relationships of sedimentation and benthic macroinvertebrate assemblages in headwater streams using systematic longitudinal sampling at the reach scale. Environmental Monitoring and Assessment 161:517-530.

National Park Service. 2009. ANC and biological integrity. NPA Air Resources Division. Source URL: http://www.nature.nps.gov/air/Pubs/pdf/200905_ANC_and_Biological_Integrity Revised final.pdf

Oliver, Chadwick, D. and Larson Bruce C. 1996. Forest stand dynamics – update edition. John Wiley & Sons, Inc., New York, NY. 520 pp.

Pritchett, W.L. and Richard E. Fisher. 1979. Properties and Management of Forest Soils. John Wiley and Sons. 500 pp.

Riedel, M.S., and J.M. Vose. 2003. Collaborative research and watershed management for optimization of forest road best management practices. In: C.L. Irwin, P. Garrett, and K.P. McDermott (eds.). 2003. Proceedings of the international conference on ecology and transportation. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University: 148-158.

Robinson, S., F. Thompson, T. Donovan, D. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. Science 267, 31.

Ryan, Michael G.; Harmon, Mark E.; Birdsey, Richard A.; Giardina, Christian P. (and others). 2010. A synthesis of the science on forests and carbon for U.S. forests. Ecological Society of America: Issues in Ecology, 13: 1-16.

Sander, Ivan L. 1972. Size of oak advance reproduction: key to growth following harvest cutting. Res Paper NC-79, USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN, 8 pp.

Schneider, Todd; Beaton, Giff; Keyes, Timothy S.; and Klaus, Nathan, editors. 2010. The breeding bird atlas of Georgia. University of Georgia Press, Athens and London. 497 p.

Silvis, Alexander, W. Mark Ford, Eric R. Britzke, Joshua B. Johnson. 2014. Association, roost use and simulated destruction of *Myotis septentrionalis* maternity colonies. Behavioral processes 103 (2014): 283-290.

Silvis, Alexander, W. Mark Ford, and Eric R. Britzke. 2015. Effects of hierarchical roost removal on northern long-eared bat *(Myotis septentrionalis*) maternity colonies. PLoS ONE 10 (1): e011635

TACCIMO (Template for Assessing Climate Change Impacts and Management Options). Accessed March 16, 2012.

Tirpak, J.M., W.M. Giuliano, T.J. Allen, S. Bittner, J.W. Edwards, S. Friedhof, C.A. Harper, W.K. Igo, D.F. Stauffer, G.W. Norman. 2010. Ruffed grouse-habitat preference in the central and southern Appalachians. Forest Ecology and Management 260 (2010) 1525-1538.

USDA Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region. Report of the Region 8 Old-Growth team. Forestry Report R8-FR 62. Southern Region, Atlanta, GA. 118 pp plus appendices.

USDA Forest Service. 2003. Forest Service Handbook 2509.18 – Soil Management Handbook. Southern Region Supplement FSH-R8-2509.18.2, pp 1-4.

USDA Forest Service. 2004a. Final Environmental Impact Statement for the Land and Resource Management Plan Revision. Chattahoochee-Oconee National Forests. Management Bulletin R8- MB 113 B. USDA Forest Service, Southern Region, Atlanta, GA.

USDA Forest Service. 2004b. Chattahoochee-Oconee National Forests Land and Resource Management Plan. R8-MB 113 A. USDA Forest Service, Southern Region, Atlanta, GA.

USDA Forest Service. 2014. Acid deposition impacts to forest and aquatic ecosystems. Source URL: http://webcam.srs.fs.fed.us/impacts/acid/

USDA Forest Service. 2014. Biological Assessment for Activities Affecting Northern Long-Eared Bats on Southern Region National Forests. USDA Forest Service, Southern Region, Atlanta, GA.

USDA Natural Resources Conservation Service. 2016a. Soil survey of Fannin and Union Counties, Georgia – current data available on-line at http://websoilsurvey.nrcs.usda.gov. [Date accessed: 11/3/2016].

USDA Natural Resources Conservation Service. 2016b. Soil survey of Cherokee, Gilmer, and Pickens Counties, Georgia – current data available on-line at http://websoilsurvey.nrcs.usda.gov. [Date accessed: 11/3/2016].

U.S. Environmental Protection Agency. 2012. DRAFT inventory of U.S. greenhouse gas emissions and sinks: 1990-2010. United States Environmental Protection Agency, Washington DC, 470 pp.

U.S. Fish and Wildlife Service. 2009. Indiana Bat *(Myotis sodalis)* 5-year review: Summary and Evaluation. USFWS Midwestern Region 3, Bloomington, IN.

U. S. Fish and Wildlife Service. 2015. Biological opinion. Activities affecting the northern long-eared bat on Southern Region National Forests. FWS Log #04E00000-2015-F-003.

Vose, J.M. and C.R. Ford. 2011. Early successional forest habitats and water resources. In: C.H. Greenberg et al. (eds.), *Sustaining Young Forest Communities,* Managing Forest Ecosystems 21, DOI 10.1007/978-94-007-1620-9-14.

Wood, P.B, J. Sheehan, P. Keyser, D. Buehler, J. Larkin, A. Rodewald, S. Stoleson, T.B. Wigley, J. Mizel, T. Boves, G. George, M. Bakermans, T. Beachy, A. Evans, M. McDermott, F. Newell, K. Perkins, and M. White. 2013. Management guidelines for enhancing Cerulean Warbler breeding habitat in Appalachian hardwood forests. American Bird Conservancy. The Plains, Virginia. 28 pp.

Wood, P.J. and Armitage, P.D. 1997. Biological effects of fine sediment in the lotic environment. Environmental Management, 21(2): 203-217.